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Department of Microbiology, Immunology and Parasitology

Research thesis on

Sero-prevanence of Hepatitis-B and C infection and the knowledge, Attitude and Practice among Healthcare Workers and Traditional Healers at selected sites of Kolfe Keranio Sub-city, Addis Ababa, Ethiopia.

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Abstract

Background: Hepatitis B and C viruses are the leading causes for global morbidity and mortality of viral hepatitis. According to the world health organization report, globally an estimated 257 million and 150 million people are living with chronic HBV and HCV respectively. The risk of these infectious blood borne pathogens are highest on the health care settings and the health care workers or people who work in the field of medicine are at highest risk for these infections. In Ethiopia, although reports showed that more than 60% of chronic liver disease and up to 80% of hepato-cellular cancers have occurred due to hepatitis B and C viral infections, still there is limited surveillance data regarding the impacts of these infectious pathogens among the health care workers and the impact of hepatitis was totally neglected among the traditional healers. So far in Ethiopia, very limited studies were conducted to show the prevalence and risk factors of hepatitis among allopathic health care workers. Yet, no studies have been conducted to show the burdens of hepatitis and risk factors among traditional healers. Therefore, further studies should be conducted to show the impact of hepatitis among the healers alongside the aliphatic health care workers.

Objective: the aim of this study was to assess the sero-prevalence and associated risk factors of hepatitis B and C among the health care workers and the traditional healers at selected study sites of Kolfe-Keraniyo sub city Addis Ababa Ethiopia.

Method: An institution based cross-sectional study was conducted from the study period of November**,** 2017toJanuary; 2019**.**Study participants were selected using a multi-stage sampling technique**.** A multi-item standardized questioner was used to collect data on the demographic information and potential risk factors for hepatitis B and C. Five to ten milliliters of blood was collected from each study participants for sero-prevalence study. The serum from each study participants was screened for hepatitis B surface antigen and anti-hepatitis C antibody by using rapid screening test kits. All positive samples for hepatitis B surface antigen had confirmed for the presence of hepatitis B envelop antigen (HBeAg) and hepatitis B nucleic acid (DNA)by laboratory test method of enzyme linked immunosorbant assay (ELISA).In addition, all hepatitis C positive samples had confirmed for the presence of hepatitis C nucleic acid (HCV-RNA) by enzyme linked immunosorbant assay test method. Finally**,** collected data were entered into Epi-Data 3.1" software and analyzed by statistical software program SPSS version 20.0 (SPSS, Chicago, IL, USA).

Results: in the study period**,** 248 (95.4% response rate) study participants had administered the questioner properly and gave blood for sero-prevalence study. The overall prevalence rate for of HBV was 2.8 % (CI= 0.7-5.4%) and for HCV was 0.8 % (CI=0.3-1.9%). Most (82.8%) study participants had good knowledge of hepatitis B and C transmission and preventive strategies. However, only 64% of participants had positive risk perception (attitude) and only 43% of the study participants had good hepatitis preventive practice. The overall prevalence rate for occupational was 56% among participants with in the past three years. Exposure for blood, body fluids, needle stick and sharp injuries were 79%, 56%, 27% and 63% respectively. Among all, only 155(62.5%) study participants had a history of anti hepatitis B vaccination and only 65 (25% of the total) was fully vaccinated. Generally, we find the risk factor analysis for hepatitis C was very difficult since its' sero-prevalence was too small. However, lengths of working time per week (COR= 9.1 p<0.043), non-compliance to safety measures (COR=9.55 P< 0.038), needle stick injuries (COR= 7.22, P<0.02) and absence of HBV vaccination history (COR= 10.62, P< 0.03) were found to be significantly associated with hepatitis B sero-positivity on univariate analysis. Finally, absence of history of vaccination remains the only significant (AOR= 9.2, P<0.02) predictor risk factor for hepatitis B infection after removing cofounding risk factors on multivariate logistic regression analysis.

Conclusion and recommendation: despite having good knowledge of hepatitis transmission and preventive measures, hepatitis risk perception (attitude) of the study participants and their hepatitis preventive practices were not good. Frequencies of occupational exposures were high yet the immunization coverage and the infection prevention training coverage were poor. Our study revealed like the allopathic health workers the risk of hepatitis is high. These all shortcoming indicate the need for regular infection prevention trainings, enhanced immunization coverage and inclusive health policy targeting the traditional healers.

Keywords: **Attitude, Healthcare Workers, Hepatitis B, Hepatitis C, Knowledge, Sero-prevalence**

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Table of Contents

List of figures and tables

List of Abbreviations

ACIP - Advisory Committee on Immunization Practices
AACG- Addis Ababa city government
AIDS - acquired immunodeficiency syndrome
ALIPB-Aklilu Lemma Institute of Pathobiology
CHCS- community health care services
FMOHE- federal ministry of health Ethiopia
HAV - hepatitis A virus
HBeAg - hepatitis B envelope antigen
HBsAg - hepatitis B surface antigen
HBV - hepatitis B virus
HCC – hepato-cellular carcinoma
HCV - hepatitis C virus
HCW - health care worker
HDV- hepatitis D virus
HEV - hepatitis E virus
KAP- knowledge, attitude and practice
NSI - needle stick injury
NIOSH- National Institute for Occupational Safety and Health
OSHA- occupational safety and health agency
PEP- Post Exposure Prophylaxis
PPE- personal protective equipment
USP- universal safety precaution
WHO - World Health Organization
WJH - world journal of hepatology
WSDOH-Washington state department of healt

Chapter one- Introduction

1.1 Background

Viral hepatitis is an inflammatory disease of the liver and it is a global public health problem. Five types of viruses are the main causes of viral hepatitis including hepatitis A (HAV), B (HBV), C (HCV), D (HDV) and E (HEV) viruses. Among all Hepatitis viruses, hepatitis B and C account for more than 96% of global viral hepatitis burden and they are the leading causes for deaths due to liver cirrhosis and liver cancer (hepato-cellular carcinoma) around the world (WHO, 2012; CDC, 2013). According to WHO report, globally an estimated 257 million and 150 million people were living with chronic HBV and HCV infections, respectively, and an estimated 1.34 million people died due to these blood-borne infections in 2015 (WHO, 2017). The burden of hepatitis B and C infection is highest in the developing world; and developing countries especially the African and Western Pacific regions accounted for more than 68% of the global burdens of these infections (Lemoineetal**.,** 2015; WHO, 2017).

The risks of HBV and HCV are highest in the health care settings; and health care workers (HCWs) are the most at-risk groups to contracting hepatitis through their occupational contamination. HCWs are frequently exposed to occupational blood-borne pathogens like hepatitis either through mucosal contamination of infectious material through the eye or the mouth or through percutaneous roots of contaminated needle stick or sharp injuries (Deuffic et al., 2011). Needle stick and sharp injuries are the common mistakes of negligence and the frequently reported risk factors for most HCWs around the world. According to the WHO's report, among 36 million HCWs around the worldwide, approximately 3 million HCWs receive an injury with an occupational instrument per year (WHO, 2016). As a result, each year around 2 million and 1 million HCWs are exposed to hepatitis B and C viruses, respectively (Coppola et al., 2016).

Like the allopathic HCWs, the risk of hepatitis is higher among traditional healers (THs) since they are also providing community health care services particularly in the developing world. The risk of hepatitis transmission from the patient to the healers largely depends on the awareness of the healers about hepatitis, their preventive practice and frequencies of infected blood exposures through their healing practice. The mostly known healing practices among THs are; oral administration of herbs, healing by injection of herbal juices, using herbal ointments on the subcutaneous cuts of the skin and spiritual healing (Peters et al, 2004; Wojcicki et al, 2007).

Since injection and application of herbs on subcutaneous skin cuts are among the healing practice used by THs, they most likely have a significant chance to be exposed for hepatitis virus infections (Audet et al, 2016). However, Occupational hazards associated with traditional healers have got scant attention and neglected in the national health policies of governments in most developing countries (Khan et al., 2017; Audet et al, 2014).

HBV is a vaccine preventable but a well-recognized occupational risk for health care workers. The risk of contracting hepatitis B largely depends on the natural or vaccine induced immunity of the HCW; and it was estimated at up to 30% in susceptible HCWs without adequate hepatitis B vaccination (Deuffic et al., 2011; CDC, 2006). In addition, the ability of HBV to be transmitted in the absence of visible blood and its ability to remain infectious on environmental surfaces for at least 7 days increased the risk among HCW (Deuffic et al., 2011; Bond et al., 1981). Hepatitis C virus (HCV) is also a potential occupational threat for health care workers and the risk of HCV infection among exposed health care workers. In fact some reports estimated up to 10.3% of HCW contract HCV after needle-stick injuries or parenteral contamination with HCV-RNA positive blood from a patient with chronic infection (CDC, 2006).

The reason for HCWs especially in the developing world to be at highest risk for occupational HBV and HCV infection is because of highest prevalence of such diseases in the general population, and they are working in a situation where there are very limited accessibilities of preventive resources (Lemoineetal**.,**2015). In Ethiopia, although reports had shown that more than 60% of chronic liver disease and up to 80% of hepato-cellular cancers have occurred due to hepatitis B and C viral infections (Tsega, 1977; Bane et al, 2014) and Ethiopia is classified under the WHOs' geographical regions of intermediate to hyper endemic viral hepatitis **(**WHO, 2013**),**there is still limited surveillance data regarding the burdens of HBV and HCV infection among HCWs.Although previous limited studies were conducted to show the prevalence and risk factors of HBV among allopathic HCWs, no studies have been attempted to show the burdens and risk factors of HBV and HCV infection among the traditional healers in Ethiopia.

1.2 Statement of the problem

Health care workers are defined to be all people who are engaged in health promoting actions and their primary intent is to enhance the health of the communities. Regardless of this, the issue of their protection from the risks of occupational infectious pathogens has been undermined in most countries; and they are often expected to sacrifice their own well-being for the sake of their patients. As a result, HCWs in most countries are subjected to work in unsafe working conditions, which leave them exposed to different kinds of occupational infectious diseases. According to occupational safety and health (OSHA), an estimated 5.6 million HCWs in the health care industry are at risk for occupational blood-borne infections including HIV, HBV and HCV (OSHA, 2013).

Despite the fact that the standard safety protocols has been made available for the HCWs since ever 1991 (OSHA, 2013), percutaneous exposures of needle stick and sharp injuries are still the most potential sources of exposure for occupational infectious pathogens among most HCWs around the world (Antoon et al., 2010; OSHA, 2013). According to Prüss-Üstün et al. (2005), globally each year an approximate 3 million HCWs are experiencing percutaneous exposure to blood-borne viruses (BBVs). Consequently, 16,000 HCV, 66,000 HBV and 200 to 5000 HIV infections are estimated to occur annually among the HCWs around the world. In addition, Occupational transmission of infectious diseases is responsible for an estimated 320 000 deaths/year among the HCWs worldwide (Driscolletal**,** 2005).

The adverse outcomes of work-related injuries are indicated to be highest among low-income countries particularly in the sub Saharan African and Middle East countries, where the prevalence of such diseases are highest but accessibilities of preventive resources are very limited (Simonsen et al., 1999; Prüss et al., 2005). These adverse outcomes of unsafe workplace injuries affect the healthcare organizations of these countries by creating financial difficulties and a reduced ability to provide health services due to shortages of man power. Previous reports had shown occupational infectious diseases caused severe work force crisis in the heath care settings especially in Africa and Asia (Clarke, et al, 2002; Lemoine et al., 2015).

The HCWs especially in the developing world are indicted to be at higher risk for contracting hepatitis by virtue of their occupational exposure. The issues of HCWs' protection have got less attention by the local governments of such countries and the strategic support from the international organizations is less to access protective materials for the HCWs in developing

countries, despite the highest prevalence of hepatitis in the general population (Elseviers et al., 2014; Simonsen et al., 1999). As a result, regardless of the fact that about 95% of HBV infection is preventable through immunization (CDC, 2006), most HCWs in the developing world are still shown to be at risk due to lack of preventive vaccine. For example, almost 40-65% of HBV infection occurred in India due to occupational contamination among unvaccinated HCWs (Elseviers et al., 2014; Simonsen et al., 1999). In Ethiopia, although recent studies have shown that more than 60% of chronic liver disease and up to 80% of hepato-cellular cancers have occurred due to hepatitis B and C infections (Tsega, 1977; Bane et al, 2014), the issues of HCWs protection from occupational risks of blood borne pathogens has got little attention, and is neglected in the national health policy of priorities (Seid, 2005; Belyhun et al, 2016; Shiferaw et al., 2016). As a result, most HCWs in Ethiopia are still shown to be at risk for occupational HBV infection due to lack of protective vaccine (Akalu et al, 2016; Desalegn and Gebreselasie, 2013), and the country ranks the least regarding this issue among the sub Saharan African countries (Malewez et al., 2017) despite the fact that anti-HBV vaccination was introduced in the EPI program of the country since the last thirteen years in 2007 (Shiferaw et al., 2012; FMOH, 2010).

Beyond the above mentioned challenges, poor awareness of the communities about the disease and their health seeking behaviors were indicated to be an important influencing factor to increase the burden of hepatitis on the health care settings of these countries (Lemoine et al., 2015; Khan et al., 2017). Although hepatitis is common in the general population, most people in the developing world have little awareness about hepatitis etiology and its ways of transmission. In addition, most of them were unaware of availability of treatment option from modern medicine. Consequently, more than 80% of people in developing world have relayed on local traditional herbalists to get medical remedies for hepatitis (Khan et al., 2017; Siddiqui, 2011). In this regard, the healers' knowledge of hepatitis and their traditional healing practices have a greater impact on the transmission and complication of the disease through hepato-toxic treatment. In addition, the healers' knowledge of hepatitis transmission and preventive ways is indicated to be an influencing factor to prevent the risks of hepatitis among them, in the communities and retrospectively on the health care settings (Koura et al., 2016; Audet et al., 2016; Pirani et al., 2015; Leonard, 2000). However, occupational hazards associated with the healers have got scant attention and neglected in the national health policies of governments in most developing countries (Khan et al., 2017; Audet et al, 2014).

In Ethiopia, Hepatitis is traditionally known as "Yewofe Beshita" by most of the communities and the name of the disease is considered as if it was transmitted by Bat. Many people still do not believe hepatitis ("Yewofe Beshita") to be communicable and did not even know the availability of modern medicine to treat the disease. As a result, most of them go to traditional healers to get medical remedies (Hannah and Mengist, 1998; Richard and Teferedegne, 1996). However, there is no still evidence-based data that shows how far the medication used by THs is effective, how far the healing practice of THs is based on the scientific knowledge of hepatitis identification, and to what extent they are protected from occupational risks of hepatitis. Some previous studies in Ethiopia had shown a tremendous knowledge gap among the THs with regard to hepatitis etiology and they were indicated as important factor for the complications of the disease through their hepato-toxic medications that contains bat meat, rat feces and alcohol to treat hepatitis (Richard and Teferedegne, 1996; Hodes, 1997; Hannah and Mengist, 1998). Therefore, further studies should be conducted to assess how far the healing practices of the healers is based on the scientific knowledge of hepatitis identification and to what extent the healers are protective against hepatitis in Ethiopia.

Lack of documentation and surveillance data was the other frequently mentioned challenges for not being able to determine the impacts of hepatitis among the HCWs in most developing countries (Simonsen et al., 1999; Prüss et al., 2005). Despite the fact that Ethiopia was classified under the geographical regions of intermediate to hyper endemic viral hepatitis, the country is still known to have poor surveillance system and national strategy for the control of viral hepatitis (WHO, 2013). In Ethiopia, very limited studies have been conducted to show HBV and HCB sero-prevalence among the allopathic HCWs. However, no such previous studies have been conducted to show the impacts of HBV and HCV infection among both herbalists and the allopathic HCWs. Therefore, this study which was aimed to determine the magnitudes of HBV and HCB sero-prevalence on both herbalists and the allopathic HCWs is hoped to be helpful to give insight regarding the prevalence of HBV and HCV among these professional groups and to trace the predisposing risk factors associated with the two infections among these professional groups.

1.3 Significance of the study

So far most studies in Ethiopia had been conducted to investigate the prevalence, the potential risk and the ultimate impacts of hepatitis among the allopathic HCWs. However, occupational risk of hepatitis among the traditional healers has got scant attention and neglected in the national health policy of Ethiopia. Despite the fact that the practice of traditional healing is most common in the country and most people relayed on them to get medical remedies, the roles of the healers in controlling communicable diseases in the community has been neglected for many years. If the infection intervention measure is to be effective in the control of communicable diseases in the community, a targeted study towards the healers is mandatory.

In Ethiopia, Several studies on the field of traditional medicine consisted mostly in the ethno botanical studies or ethno-pharmacological plants used by the healers for the treatment of hepatitis. However, no studies have been conducted to show the potential risks of HBV and HCV among the healers, investigate how far the healing practice of the healers is based on the scientific knowledge of hepatitis; to what extent they are protected against the disease and the role of the healers in the infection intervention activities to prevent the potential risks of hepatitis among them and in the community.

Therefore, the outcome of the study, which aimed to assess the potential risks of HBV and HCV among the traditional healers and the allopathic HCWs, is hoped to have great importance in highlighting the potential risks of HBV and HCV among the THs as compared to the allopathic HCWs, to show the current images of the healers' knowledge, attitude and practice to protect themselves from the potential risks of these infectious diseases and highlighting the roles of the healers in controlling the spread of the disease in the communities. In addition, the study outcomes would be used as a baseline data for further surveillance study in related field. Furthermore, we hope that the study outcomes would have a great importance for the government health policy makers to deal with and set an inclusive infection intervention health policy towards the traditional healers.

Chapter two- Literature Review

2.1 Natural History and Pathogenesis of Hepatitis B and C virus

I. Hepatitis B virus (HBV)

Hepatitis B virus (HBV) is an enveloped DNA virus in Hepadnaviridae family which is the most infectious and the leading causes for global morbidity and mortality of viral hepatitis (Ganem and Varmus, 1987). HBV is mainly transmitted through infected blood, semen, and other body fluids from a person infected with the disease primarily through unprotected sex, vertically from an infected mother to a child, unsafe injection in multiple drug users, traditional tattooing practice and contaminated needle stick and sharp injuries (WHO, 2012).

The severity of HBV infection ranges from acute symptomatic inflammation of the liver (jaundice) to asymptomatic chronic liver cirrhosis or Hepato-cellular carcinoma (HCC). Since chronic HBV is asymptomatic, majority of people are unaware of their HBV infection. Between 20% and 30% of those who become chronically infected will develop the worst stages of liver cirrhosis or hepato-cellular carcinoma (HCC). Consequently, an estimated 650 000 people die annually due to chronic hepatitis B (Beasley et al. 1981; WHO, 2015).

Laboratory Diagnosis of HBV Infection; HBV has different serological markers which appear at each clinical stages of HBV infection and the sero-status of individuals who had been infected with HBV is confirmed by the laboratory detection of HBV serological markers in the blood sample. For example;

Detection of Hepatitis B surface antigen (HepBsAg): Usually used as screening test for acute and chronic HBV infection. Sometimes, this test may not confer the real infection of HBV, because the test can also be positive due to vaccination (WHO, 2015).

Detection of antibodies for HBV surface antigen: this screening test used to detect the patient's antibody that produced either in response to the viral antigen or synthetic vaccine of HepBsAg. Therefore, additional confirmatory tests should be run to check whether the antibodies are produced due to HBV infection or vaccination (WHO, 2015; Schryver et al., 2010).

Screening test for Hepatitis B core antibody (HepBcAb): This is an antibody against Hepatitis B core antigen which remains in the serum for life-long (whether or not they clear the virus) after HBV. So, this screening test can be used when the level of HBsAg is in undetectable level during the window period and to confirm whether HBsAg positivity is due to the real infection or vaccination (WHO, 2015).

Screening test for Hepatitis B e antigen (HepBeAg): Hepatitis B e antigen is a protein which is expressed when the virus is replicating at a high level and it is often found in patients who have abnormal LFTs and chronic Hepatitis (WHO, 2015; Schryver et al., 2010).

Hepatitis B PCR: Usually used as a confirmatory test for HBV infection. PCR or polymerase chain reaction is a very sensitive method used to detect Hepatitis B DNA in the serum sample. It is either qualitative(Schryver et al., 2010; Tuttleman et al., 1986).

Preventive Measures for HBV infection: HBV infection can be prevented through vaccination; and a recombinant DNA-derived vaccine has been available since 1997 (WHO, 2017). The primary hepatitis B immunization series conventionally consists of three doses of vaccines that are administered sequentially at a start, one month later after the first vaccination and 6 months later after the second vaccination (0, 1 and 6 months) as WHO's standard schedule of vaccination(WHO, 2015). Furthermore, HBV infection is prevented by avoiding any ways of predisposing risk factors for the transmission of HBV infection.

Treatment options for HBV infection: Concerning treatments options of HBV infection, currently different antiviral drugs(e.g., tenofovir, entecavir) are approved for the treatment of chronic HBV in high-income countries and they are shown to be efficient(WHO, 2017). However, acute HBV infection is recovered with no lasting liver damage and it is rarely fatal (WHO, 2015).

II. Hepatitis C

Hepatitis C virus (HCV) is a single-stranded positive-sense RNA virus in the Flaviviridae family which is also the most infectious and the leading causes for the global burdens of chronic hepatitis (WSDH, 2016). HCV is transmitted through contamination of infected blood and body fluids mainly through sharing of contaminated needles or sharps, unsafe sexual practice with an infected person and vertically from infected mother to a child. Injecting drug users, Men who have sex with men and HCWs in health care settings are the most at-risk populations for HCV infection (CDC, 2001). HCV can cause both acute and chronic infection but detection of newly acquired acute infection is very difficult because only a very small proportion of acute cases appear to manifest a clinical illness (WSDH, 2016). As a result, most people who have recently become infected with HCV are not aware of being infected and don't seek medical care as soon as possible for acute hepatitis C infection. Consequently, 75%-85% of newly infected persons

develop chronic hepatitis C infection of liver cirrhosis or hepato-cellular carcinoma (WSDH, 2016; CDC, 2001).

Laboratory diagnosis of HCV infection: The serological status of a person with acute HCV infection is revealed by the laboratory detection of HCV serological markers in the blood sample. Different serological tests have been developed since the virus's isolation in the late 1989 during which detection of anti- HCV antibody test was discovered (Choo et al., 1989). The antibody tests contain antigens derived from the conserved parts of the HCV genome and First-generation EIAs were developed based on the detection of antibodies to a part of the HCV C100 antigen (McFarlane et al., 1990). But due to its high false positivity rates and less sensitivity, second-generation EIAs which incorporated structural antigens of HCV in addition to the C100 antigen, was developed with improved sensitivity and specificity (McFarlane et al., 1990; Watson et al 1992). The third generation ELAs of RIBA2 system, which incorporated four different recombinant HCV antigens, was also developed to increase test sensitivity and reduce false positive rates (McFarlane et al., 1990; Watson et al 1992). Beside this screening antibody test, detection of HCV RNA antigen typically by reverse transcriptase (RT-PCR), in situ hybridization, and branched DNA amplification assays are used as a confirmatory HCV antigen tests (WSDH, 2016; CDC, 2001).

Prevention and Treatment of HCV infection: HCV can be prevented by avoiding predisposing risk factors by any ways of HCV transmission roots. Protection from HCV infected blood or body fluid is the ultimate choice of prevention since there is no protective vaccine developed so far for the prevention of HCV infection (CDC, 2001).

Regarding treatment of chronic HCV infection, different anti-viral drugs have been available since ever HCV was discovered in 1989(Choo et al., 1989). The first HCV treatment was based on various types of interferon. The addition of an antiviral drug ribavirin increased cure rates. However, treatments based on interferon/ribavirin were poorly tolerated, associated with severe adverse effects, and resulted in cure rates of between40% and 65%, depending on various factors. A dramatic improvement in HCV therapy followed the introduction of oral medicines that directly inhibited the replication cycle of HCV, called direct-acting antiviral (DAAs).In 2013, sofosbuvir was registered in the United States of America. DAAs are usually used in combination and they are efficient to reduce complications of HCV infection (WHO,

2017).However**,** most people with acute HCV infection recover with no lasting liver damage; and acute illness is rarely fatal (CDC, 2001; WHO**,** 2017).

2.2 Global Distributions of Hepatitis B and C

HBV and HCV are global health problems and the leading causes for global morbidity and mortality of viral hepatitis (WHO, 2017). According to WHO's (2017) report, globally an estimated 257 million and 71 million people were living with chronic HBV and HCV infections, respectively in 2015. In addition, viral hepatitis due to HBV and HCV was responsible for the deaths of an estimated 1.34 million people around the world in the same year (WHO, 2017). Viral hepatitis mostly affects people who live in low to middle-income countries where screening and treatment accesses are not readily available (WHO, 2017). In Ethiopia, studies had shown more than 60% of chronic liver disease and up to 80% of hepato-cellular carcinoma (HCC) are due to chronic HBV and HCV infections (Belyhun, 2016; Bane et al, 2014). In addition, liver disease accounted for 12% of hospital admissions and 31% of hospital mortality (Belyhun, 2016; Bane et al, 2014).

Distribution of HBV: HBV mostly affects the WHO African and the western pacific region. Africa has the second largest number of chronic HBV carriers after Asia and is considered as a region of high endemicity (Hwang and Cheung, 2011). In Ethiopia, the previous population based study showed that; thee pooled prevalence of HBV was 7.4% (95%CI: 6.5–8.4) in the general population (Belyhun, 2016).

Distribution of HCV: the epidemic caused by HCV affected all regions with highest report of prevalence at eastern Mediterranean and the European Regions (WHO, 2017). Despite its high prevalence and highly infectious nature, HCV remains under-diagnosed and under-reported in most African countries (WHO, 2013). According to WHO report, HBV infection affects more than 5% of the local population in Sub-Saharan Africa and more than 8% in West Africa (WHO, 2017). The prevalence of HCV infection varies geographically with estimates between 3% and 5.3% and Egypt bears the highest HCV prevalence with a recent estimation of 14.7% (WHO, 2017; Lemoine et al., 2015). In Ethiopia, the previous population based study showed that; the pooled prevalence of HCV was 3.1% (95% CI: 2.2–4.4) in the general population (Belyhun, 2016).

2.3 Burden of Hepatitis B and C on the Health care Settings

Viral hepatitis on the health care settings is a global health problem; and HCWs are the most at-risk groups of the community to acquiring hepatitis due to their occupational contamination. Hepatitis B and C viruses are still the leading causes of morbidity and mortality among HCWs around the world (Coppola et al., 2016; Deuffic et al., 2011). HCWs such as physicians, dentists, nurses, midwives and laboratory staffs are the most at risk professional groups for occupational transmission of hepatitis since they have highest potential to be contaminated with blood of the patient they serve (Kermode et al, 2005). HCWs are frequently exposed to occupational infectious pathogens through the two most common exposure roots of either muco-cutaneous contamination of infectious material splashes through the eye and the mouth or percutaneous roots of contaminated needle stick and sharp injuries. Percutaneous needle stick and sharp injuries are the most common exposure roots and they are accounted for more than 75% of exposures among HCWs (Deuffic et al., 2011).

According to the WHO's report, an estimated 36 million HCWs are at risk for occupational infectious pathogens and each year approximately 3 million HCWs are exposed to infectious blood-borne pathogens through occupational injuries (Coppola et al., 2016; Pruss-Ustun et al 2003). As a result, each year around 2 million and 1 million HCWs are exposed to hepatitis B and C infections, respectively (Coppola et al., 2016; Pruss-Ustun et al 2003). Occupational percutaneous injury is still the common mistakes of negligence among HCWs and it is the leading risk factor even among the HCWs in the most advanced health care settings. According to the WHO, each year many healthcare workers in Europe are at risk of acquiring an infectious disease after a percutaneous exposure. Hence, each year 304 000 and 129 000 health care workers are exposed to HBV and HCV, respectively, after percutaneous injuries (Puro et al, 2005; Pruss-Ustun et al, 2005).

2.4 Risk factors for occupational transmissions of HBV and HCV

HCWs should have a complete knowledge of hepatitis transmission and prevention to avoid occupational risk of HBV and HCV infections. The risk of hepatitis has been indicated to be higher among the HCWs for those who don't have adequate knowledge on hepatitis transmission and universal safety preventive measures (Sreedharanet al., 2010).Although there is evidence on the existence of adequate knowledge about hepatitis transmission and preventive ways, transferring this knowledge into practice was shown to be a big challenge among most of the

HCWs **(**Sreedharan etal**,** 2010**).** Data on workers' attitudes and risk perception showed that most HCWs are exposed to occupational risk factors because of their poor perception and underestimating the risks of occupational infectious pathogens like hepatitis **(**Benítez etal**,** 1999; Boal et al, 2008**).**

Unlike the allopathic HCWs, the traditional knowledge of disease identification and treatment practice are by far different from how knowledge of illnesses and treatment is applied under the perspective of modern medicine. Most THs are not educated in modern school and most of the time they acquired their knowledge about the disease through traditional knowledge transfer of what had been known in their parents and ancestors **(**Bagwana, 2015**).** The risk of hepatitis transmission from the patient to the healer largely depends on the awareness of the healers about the disease etiology, transmission ways and how safe their healing practices. Traditional belief of the disease etiology is the most frequently identified knowledge gap among THs (Peters et al, 2004; Wojcicki et al, 2007; Koura et al, 2016).

The risk of occupational infectious pathogens like hepatitis viruses largely depends up on how risky the medical procedures performed by a HCW is, the types of exposing sample, the roots of exposure, the immunological status of a HCW and frequencies of occupational exposures (CDC, 2003; Olubuyide et al, 1997). The infectivity of hepatitis is highly increased if the type of transmission media (sample) was infected blood. However, transmission can also be possible in lesser degrees from body fluid exposures such as breast milk, bile, and cerebrospinal fluids. The probability of being HBV positive is estimated up to 62% after contamination with HBeAg positive blood containing a viral load of>6 log10 copies/mL (CDC, 2013).

The type of medical procedures used by each HCW is the other significant factor that determines the likelihood of HBV/HCV transmission (Olubuyideetal**,** 1997). For example, HCWs who perform invasive medical procedures like surgeons, dentists, nurses, midwives and laboratory professionals who handle infectious specimens are shown to have higher probability to be exposed to occupational infectious blood borne pathogens like hepatitis **(**Olubuyide et al, 1997; Daw et al, 2000**).** The risk of hepatitis is highly increased if the exposure root was through percutaneous and the exposed HCW was not fully vaccinated (CDC, 2013). Percutaneous exposures of needle stick and sharp injuries are the commonly mentioned risk factors for occupational transmission of blood borne pathogens like hepatitis among the HCWs (Perry et al, 2004). For a susceptible HCW without anti-HBV vaccination, the risk of HBV infection from a

single needle stick injuries is estimated to be 6-30% (Deisenhammer et al, 2006**;** Wicker and Rabenau, 2011) from the blood of HBV positive source patient, whereas the average risk for HCV infection after a needle stick injury is estimated to be approximately 1.8% from HCV infected blood (CDC, 2003).

Different other studies from different countries have also shown how the risk of needle stick injuries is significant for occupational transmission of HBV and HCV among HCWs. For example; a case-control study from Pakistan showed about 851 (7.29%) HBsAg and 713 (6.16%) HCV antibody positive cases were detected among the HCWs who had a history of needle stick and sharp injuries (Gorar et al, 2014). The prevalence study provided by Souly et al. (2016) from Morocco showed that 19 HBsAg and 15 anti-HCV antibodies positive cases were detected among HCWs who had a history of needle stick injuries; and risk factor analysis of their study revealed needle stick and sharp injuries to have taken over 81.25% of risk factors for all positive causes. In Ethiopia different studies also showed the risk of hepatitis among HCWs due to needle stick and sharp injuries. For example, a cross sectional prevalence study conducted among HCWs of St Paul Hospital showed that among 313 HCWs, 8(2.6%) HBV positive cases were identified and Needle stick (33.9%) and sharp injuries (35.5%) were found to be independent risk factors potentially associated with hepatitis-B infections (Akalu et al, 2016).

Among the traditional healers, the practice of unsafe injection has been shown to be a significant risk factor for occupational transmissions of infectious pathogens (Peters et al, 2004; Wojcicki et al, 2007).For example**,** the study form Mozambique showed that among all study participants of the healers, over 75% of them were found to use injection as the healing practice and majority of them experienced needle stick injuries (Audetetal**,** 2016). In addition, their comparative risk analysis showed higher risk for infectious pathogens among THs who performed injection healing practice than others who did not (Audet et al, 2016). Work stress due to spending prolonged working hours without sufficient rest is the other predisposing risk factor indicated to increase the probabilities of exposures among HCWs. For example, the surveillance data provided by workers' safety center in the University of Virginia (2002) documented work stress to be a cause for the overall 1,693 percutaneous injuries among HCWs at different states of America in the year 2002(Perry et al, 2004). Similar pooled prevalence study conducted in 21 African countries showed the pooled prevalence of occupational exposures to be 65.7% among

HCWs (Asa et al, 2017). The root causes indicated by the study were prolonged working hours without sufficient rest due to shortages of man power and lack of infection prevention trainings.

2.5 Strategies to protect HCWs from occupational risks of Hepatitis

Infection prevention is the primary strategy to reduce occupational risk of HBV and HCV transmission among HCW. Occupational infection by blood borne pathogens can be prevented by adhering to universal safety precautions including proper use of personal protective barriers(gloves, gowns, face mask, etc.), avoiding unsafe injection, proper sterilization of medical equipment and by adopting proper medical waste disposal management systems (Molinari, 2003). HCWs should be made aware of the medico legal and clinical relevance of reporting their occupational exposure to receive proper treatment and follow up as early as possible. In addition, there should be a system regularly addressing capacity building training regarding infection prevention to reduce occupational risks of infectious pathogens (WHO, 2015; CDC, 2011; Molinari, 2003).

Anti-hepatitis B vaccination is the most effective measure to prevent occupational hepatitis B virus (HBV) infection and it has been used as primary preventive measure since it was recommended first in 1982(CDC, 2011). Healthcare workers should be vaccinated early after the start of their career and should complete the three standard doses of intramuscular anti-HBV (Engerix-B, Recombivax HB) vaccines. Anti- HBV vaccine is efficient enough to provoke $\geq$10 IU/mL level of serum immunoglobulin for the protection of HBV infection with 90-95% protection efficiency (CDC, 2011). However, the serum anti-HBs level of HCW should be assessed 1-2 month after completion of a 3-dose vaccination series to evaluate their response to the vaccine (CDC, 2011; Noah et al., 2013). In addition, the healthcare organizations should have protocols for prompt reporting and post exposure management of infectious pathogens. An exposed HCW should take post-exposure prophylaxis within 7 days after accidental exposure; and if so, post exposure prophylaxis can reduce the likelihood of being positive after exposure (CDC, 2011). However, adapting universal safety precautions are the ultimate choice left for HCWs to prevent occupational risk of HCV infection since currently there is no protective vaccine against HCV infection (Askarian et al., 2011, CDC, 2011).

Chapter three- The Research Project

This study was the sub thematic research component of the mega project entitled ‘’Investigation on anti-hepatitis medicinal plants, knowledge of health workers, serological epidemiology and genotypes of hepatitis in Ethiopia’’ at Aklilu Lemma Institute of Pathobiology (ALIPB). In addition, it was a research title approved for the fulfillments of requirements in master of degree in microbiology at A.A University, medical faculty department of microbiology, immunology and parasitology. Therefore, the study has been conducted by getting a joint collaborative support for the research funding and advisory service from DMIP, ALIPBand the Graduate Study Program of Addis Ababa University.

3.1 Research Objectives

3.1.1 General objective

- To investigate the sero-prevalence of hepatitis B and C infection and associated risk factors among high risk health care workers and traditional healers at selected health facilities in Kolfe-Keranio sub-city, Addis Ababa.

3.1.2 Specific objectives

- To investigate the magnitudes of hepatitis B and C virus infections among health professionals and traditional healers at selected study sites of Kolfe-Keranio sub-city in Addis Ababa.
- To assess the KAP of health care workers and traditional healers towards hepatitis B and C virus infection at selected study sites of Kolfe-Keranio sub-city in Addis Ababa.
- To investigate core predisposing risk factors for hepatitis B and C virus infection among health professionals and traditional healers at selected study areas of Kolfe-Keranio sub-city in Addis Ababa.

3.2 Materials and Methods

3.2.1 Study design, area and period

This institution based cross-sectional study was conducted from November, 2017 to January, 2019 to assess the magnitude of Hepatitis B and C virus infections and identify associated risk factors among health professionals and traditional healers at selected study sites of Kolfe-Keranyo sub city, Addis Ababa (See Figure 1). Keranyo sub city is located at the North West border of the capital city covering 63.48 km^2 areas and with altitude ranges of 2,388-2,546m height above sea level. The sub city is bordered with Gullela sub city at the north, Addis Ketema and Ledeta sub-cities at the northeast, Nefas Silk-Lafto sub city at the south, and Oromiya region at the west. The sub city is among the wider and densely populated (population densities of 8,660.9/ km2) sub cities in Addis Ababa (AACG, 2018).

According to Kolfe-Keranyo sub city Health Bureau, a total of 549,797 people of different ethnicity, and on average with poor socio-economic status and educational backgrounds are living in the sub city. The sub city comprises 13 governmental health facilities (11 health centers and 2 hospitals) and 89 medium to higher private clinics that provide community health care services. In addition, there are many traditional healers; the sub city is the place where the practice of traditional healing is higher. Most people in the sub city use traditional healing since the numbers of health facilities are very limited as compared to the sub city's population size. Today, 12 legally recognized traditional healers provide community health care service in the sub-city. This was an important factor to consider the sub city for purposefully selecting it as the study area.

Fig. 1 Map of Kolefe-Keraniyo sub city

3.2.2 Study Sites

This study was conducted at four selected health centers (woreda 01, 03, 04 and 09 HC) and focal sites where legally recognized traditional healers are practicing in the sub city. The selection preference for health centers were made based on facilities with highest burdens of community health service, and that had statistically significant case reports of hepatitis B and C infection per year based on the sub city's health office information. Furthermore, these sites were selected for the reason that lots of traditional healers are practicing in the area. The profiles of the selected study sites are shown at annex III.

3.2.3 Study Population

Study participants for the study were recruited based on the selection criteria from a total of 409 study populations at the selected four study sites (annex III). The inclusion criteria to select HCWs for the study were all HCWs (both traditional healers and mainstream health workers) who are perceived to have highest occupational risks and had frequent contact with patient's blood and body fluids including; Doctors, health officers, midwives, nurses and laboratory technicians. In addition, traditional healers who were registered and recognized as traditional healers were included in the study. HCWs who had less occupational risks and do not have frequent contact with patient's blood including pharmacists, environmental health professionals, other HCWs who work in offices and traditional healers who were not legally recognized were excluded from the study based on exclusion criteria.

3.2.4 Sample Size Determination

The required sample size (260) for this study was determined by using single population proportion formula (Thrusfield, 1995).

$$n = \frac{(Z\alpha/2)^2 \, P \, (1-P)}{d^2}$$

Where, n = the number of health care workers to be studied;

Z =standardized normal distribution value for the 95% confidence interval (1.96),

P = prevalence of the diseases in population proportion

d= 3% margin of error.

In this calculation, the P (5.9%) value or prevalence of the disease was determined by taking the mean HBsAg prevalence among the HCWs (9.02%, 2.6%, 9.7% and 2.4%) from the previous four studies at different health care settings of Addis Ababa, Ethiopia (Seid, 2005; Desalegn and Gebre-Selassie,2013; Akalu et al., 2016; Kefenie et al., 1989). Accordingly;

$$n = \frac{(1.96)^2 x (0.059)\ (0.941)}{(0.03)^2}$$

$$= \underline{237}$$

Finally, the resultant minimum sample size of 260 was obtained after adding 10 % from the calculated value of 237 for non-response rates.

3.2.5 Sampling Technique

Regarding sampling technique, multistage sampling techniques of both probability and non-probability sampling techniques were applied to get a sample of THs and HCWs at each selected study sites. A proportionate numbers of sample size were distributed first by virtue of quota sampling to get a proportionate numbers of study participants from each selected study sites. The quota sample size at each study sites was determined by calculating the number of study participants at each study sites as their proportional size from the total numbers of study population (409). Accordingly, 62(24%) was a sample quota to recruit a sample of HCWs from woreda 01(Koshe HC), 60(23%) was from woreda 03 HC, 68(26%) from woreda 04(Alem bank HC), 62(24%) were from woreda 09 HC and 8(3%) was from THs.

Then, the HCWs at each study sites were stratified based on high risk professional categories like doctors, nurses, health officers, midwives and laboratory technicians. Finally, it was planned to select a random sample of participants from each stratum of HCWs at each study sites using a lottery method. However, randomization was very difficult since an enrolment to participate in this study was largely on voluntary bases. Therefore, great effort was made to avoid this selection bias by including proportionate numbers of study participants from each at risk professional groups including; physicians, HO, Nurses, midwives, Lab and THs.

3.2.6 Data Collection Method

Data collection was conducted after briefly explaining the objectives of the study and informed consent was received from each of the study participants. A standardized, structured and coded questionnaire which was adopted from the Iranian psychometric standardized questionnaire was used to collect the data (Ghasemi et al**,** 2012).The questionnaire was prepared in both English and Amharic languages considering that participants would have different educational backgrounds (annex IV).

The questionnaire contained some queries used to collect information about the socio-demographic characteristics of the study participants like age, sex, marital status, professional category, work experience and average numbers of hours on duty per week. In addition, it also contained quarries to trace out risk factors including; quarries to evaluate the level of knowledge of the study participants about HBV and HCV transmission and preventive strategies, quarries to evaluate risk perception (attitude) of the study participants and quarries to evaluate hepatitis preventive practices of the study participants.

Before the actual time of data collection, the clarity and consistency of the questioner was checked. In addition, the pre-designed questionnaire was pre-tested among HCWs on other health facilities and data collectors were trained to collect the data. Standard operating procedures (SOPs) were followed properly in the whole course of data collection. All data were checked for completeness, accuracy and consistency during administration of the questionnaire. Focus points of the questioner are depicted in the flowchart of Figure 2.

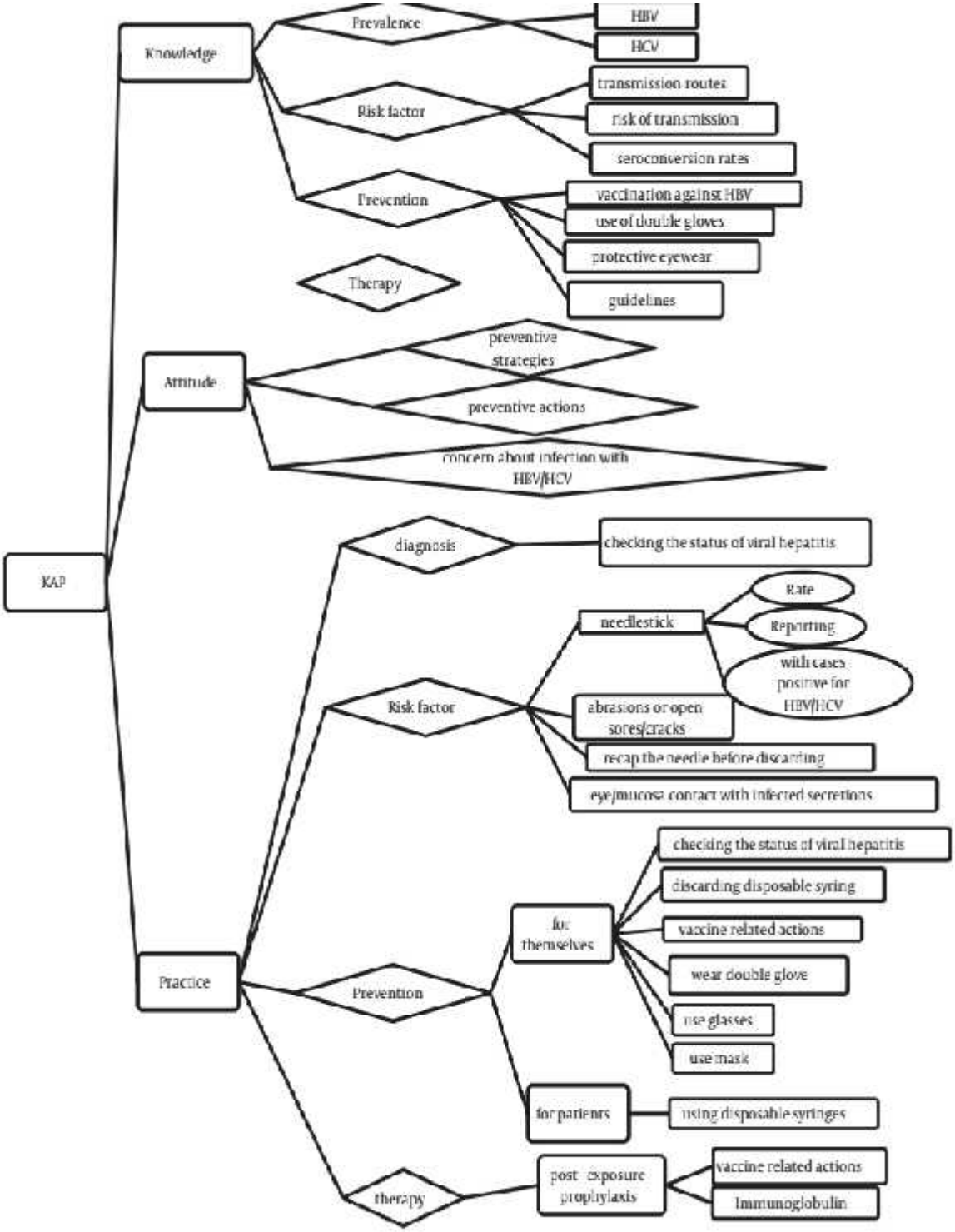

Fig. 2 Flow chart showing focus points in the questioner of KAP study

3.2.7 Laboratory Serological Test Methods

The laboratory procedure was done after consent was obtained from each volunteer study participant and the returned questionnaires were checked for completeness. Having done these, a 3-5 ml of venous blood sample was collected from each study participant using pre labeled vacutainer plain tubes. The blood samples in plain tubes were allowed to clot for 30 minutes and then centrifuged at10, 000 rpm for 10 min to separate the serum. Before each serum samples was screened for HBsAg and HCV antibody, the validities of the rapid screening test kits were checked first by using positive and negative controls provided by the manufacturers in the test kits. In addition, the validities of the rapid screening test kits were also checked by using known positive and negative control sera which were kept in Alem Bank Health Center laboratory.

Having done the validity checkup, each serum sample was screened for hepatitis B surface antigen (HBsAg) by using Eco a one step- HBsAg rapid screening test kit (EcoTest®HBsAg-P11 test strips (Asure Tech (Hangzhou) Co. Ltd., Hangzhou, China). This rapid immuno-chromatographic test kit has sensitivity of 96.2 % and a specificity of 99.4 % for the visual detection of hepatitis B surface antigen (HBsAg) in human serum. This test kit utilizes the antibody conjugate immobilized in the test pad and uses the colloidal sandwich method as the test principle (Schryver et al., 2010). If HBsAg is present in the test sample, it binds with the antibody conjugate on the test caste and their Ag-Ab combination produces a visible color band which indicates a positive test result. In addition to HBsAg , each serum sample was screened for the presence of anti- HCV antibody by using EGENS, a one steep anti-HCV immuno-chromatography rapid test kit (EGENS Diagnostics, Nontong Egens Biotechnology Co., Ltd, China).This test kit has 99.3% sensitivity and 99.0 % specificity for the qualitative determination of anti-HCV antibodies in the test sera and it utilizes a double HCV antigen sandwich method as test principle (McFarlane et al., 1990). If ant-HCV antibodies are present in tested sera, they bind with HCV antigen that was impregnated on the test pad and the Ag-Ab complex makes a visible color band which indicates a positive test result.

Finally, each test results were registered on the laboratory test result tracking sheet and all positive serum samples were kept in the refrigerator at 4°C per international protocol for no more than 4 weeks (Mel et al, 2005) just before the positive samples were sent to further confirmation. At confirmatory laboratory centers(AHRI and ARSHO), all HBsAg positive sera by rapid screening test kits were confirmed by the detection of HBeAg by ELISA laboratory test method

and by quantification of HBV-DNA nucleic acid by polymerase chain reaction (PCR) test method. In addition, all anti-HCV antibody positive samples were confirmed by the detection of HCV-RNA nucleic acid by ELISA laboratory test method per standard recommendation for confirmation of HCV (CDC, 2001).

3.2.8 Data Quality Management, Analysis and Interpretation

The collected data were coded and then entered and cleaned using "Epi-Data 3.1" software. The data analysis was done using statistical software program SPSS version 20.0 (SPSS, Chicago, IL, USA) as per the type of data. Sero-prevalence of HBsAg, and anti-HCV were taken as dependent variable and participants' demographic information such as age, gender, professional category, duration of service, and average hours on duty per week were independent variables of the study. Descriptive statistics like frequencies and proportions were used to summarize categorical data. Bivariate and multivariate analyses were used to examine the relationship between the dependent variables and selected socio-demographic factors. Adjusted odds ratios (AOR) and their 95% confidence intervals (CIs) were used as indicators of the strength of association between the outcome variable and the predator variables. A P value of 0.05 or less was used to indicate statistical significance.

3.2.9 Operational Definitions

Allopathic Health Care Workers: In this study it is intended to indicate those health care personnel with conventional medical knowledge and trainings. In addition, health care workers who were involved in day-to-day patient care in health care setting and those who use western medicine to treat their patients.

Traditional Healers: health care providers who provide medical service based on their traditional knowledge of the disease identification, and use ethno- botanical or spiritual healing practice to treat their patients (Koura et al, 2016).

Knowledge: understanding of respondents towards hepatitis B and C occupational transmission and prevention strategies. Good knowledge score was taken as a result from attendants who scored greater than or equal to 70% of the knowledge questions (Gashu, 2015).

Attitude: The feeling and beliefs of respondents in a favorable or unfavorable manner toward HBV and HCV infections. Positive attitude was taken as scores greater than or equal to 69%, negative attitude was taken as a scores less than 69%; and a score equal to 69% was considered as neutral (Gashu, 2015).

Practice: The actions intended to do in order to prevent occupational transmissions of hepatitis B and C infections. Good practice was taken among respondents who scored greater than or equal to60% of the intended preventive practice (Gashu, 2015).

3.2.10 Ethical Consideration

This study was approved by the Ethics Committee of the Department of Microbiology, Immunology and Parasitology, Addis Ababa University. A written informed consent was obtained from all study subjects. The result of the research was kept confidential and confidentiality was maintained by numeric coding of serum samples and questionnaires. Results were communicated to the respective individuals for proper counseling and further care.

Chapter four- Results

4.1 Demographic Information of the Study Participants

Among 260 potential study participants, 8 of them had returned the questionnaires incomplete and 4 of them refused or changed their mind to give blood for the laboratory investigation. The rest 248 study participants (95.4% response rates) had completed the questionnaires and had given blood for the study. Of these 248 study participants, 83(33.5%) were males and 165(66.5%) were females with 1:3 male to female ratio. The mean age of study subjects was 31±7.9 SD (CI 30-32) ranging from minimum of 21 years to maximum of 59 years. Most (72%) of the study participants were between the ages of 20-30 years. The majority [145 (58.5%)] were married and 103(41.5%) were unmarried (Table 1).

In regards to participants' professional categories,129 (52.1%) of them were nurses, 44(17.7%)health officers (HO), 40 (16.1%) midwives, 24 (9.7%)laboratory professionals, 8(3.2%) traditional healers, and only 3(1.2%)of them were physicians. Regarding the educational backgrounds of the study participants, about 106(43.4%) of them were found to have college diploma, 122(50%) first degree, and16 (6.6%) second degree (MSC). The rest 4(1.6%) of the study participants were traditional healers and were found to have had only a primary education level.

Participants' duration of service varied between a minimum of 1 year to maximum of 25 years with 5.6±4.9 SD mean year of service. However, the overwhelming majority [180 (72.6%)] had in the service category between 1 to 5 years. Data on their workload indicated that 102(41%) of participants spent more than 40 hours on duty per week and the rest 146(59%) 40 or less hours on duty per week. The socio- demographic information of the study participants is summarized in Table 1.

Table 1: the socio-demographic characteristics of the study participants

variables		number of participants	Percentage (%)
Response rates		n = 248	95.4%
Age groups	20-29 years	153	61.7%
	30-39 years	61	24.6%
	40-49 years	23	9.3%
	50-59 years	11	4.4%
Gender	male	83	33.5%
	female	165	66.5%
Marital status	Married	145	58.5%
	Un married	103	41.5%
Professional category	Physicians (Dr)	3	1.2%
	health officers	44	17.7%
	midwives	40	16.1%
	Nurses	129	52.1%
	Laboratory Professionals	24	9.7%
	Traditional healers	8	3.2%
Educational background	College diploma	106	43.4%
	First degree	122	50%
	Second degree(MSC)	16	6.6%
	Primary school not completed	4	1.6%
Duration of service	1-5 years	180	72.6%
	6-10 years	40	16.2%
	11-15 years	10	4%
	16-20 years	10	4%
	21-25 years	8	3.2%
Average No of hours on duty in hrs/week	≤ 40	146	59%
	41-50	40	16%
	51-60	29	12%
	>60	33	13%

4.2 Sero-prevalence of HBV and HCV infections; and their distribution among participants' demographic factors

Among the 248 study participants who had screened for HBsAg and anti-HCV antibody, 11 HBsAg and 2 anti-HCV antibody positive cases were identifiedby rapid screening tests. However, after confirmatory test for HBsAg positive samples (HBeAg detection by ELISA and HBV-DNA quantification by PCR), only 7 HBV confirmed positive cases were identified and the prevalence of HBV was found to be 2.8% (CI= 0.7- 5.4%). In addition, both anti-HCV antibody positive samples by rapid tests were also found to be positive after a confirmatory HCV-RNA detection by ELISA and the prevalence of HCV was found to be 0.8% (95% CI =0.3 to 1.9%) among all the study participants. In this prevalence study, none of hepatitis positive cases was identified with co-infection of both HBV and HCV.

Although the prevalence of HBV was not significant (p= 0.841), it was found to be large enough for comparison and risk factor analysis between the study groups. Age specific HBsAg prevalence was found to be progressively increased across the age groups up to specific point and then decreased progressively as the age advanced. It was 0.4% (1/153) among the study participants in the age group of 20-29 years, 1.2%(3/61) in the age group of 30-39 years, 0.8% (2/23) in the age group of 40-49 years and 0.4% (1/11) in the age group of 50-59 years. However, statistically significant difference was not seen in HBsAg prevalence between these age groups (p>0.05). In the same way, although significant difference was not seen between sex groups (p=0.073), sex specific HBsAg prevalence was found to be higher among males (4/83) than females (3/165). HBsAg prevalence was found to be slightly higher (1.6 %) among the proportion of married study subjects than unmarried participants (1.2%) although the difference did not reach significant level (p= 0.346).

HBsAg across professional groups was found to be highest among nurses with 1.2% prevalence rate, followed by midwives (0.8%), medical laboratory professionals (0.4%), and then the traditional healers (0.4%). However, no significant (P >0.05) difference was observed between these professional groups' HBsAg prevalence. Comparison of HBsAg prevalence by service years of the study participants showed comparatively higher rate among thosein the 1-5(0.8%) and 11-15(0.8%) service year groups than those in the other service year groups. However, significant difference was not seen (P >0.05) in HBsAg prevalence between each service year categories. Similarly, comparison of HBsAg by length of working hours per week showed a

progressive increase as the numbers of working hours increased. HBsAg prevalence was 0.4% among participants who spent ≤40 hrs/week, 1.2% among those who spent 41-50 hrs/week, but it declined again with 0.8% among those who spent 51-60hrs/week and more than 60 hrs per week. However, when HBsAg prevalence was categorized into two groups (those who spent ≤40 hrs/week and >41 hrs/week on duty), a significant difference (P=0.04) was observed with the study participants who spent >41 working hours per week having higher HBsAg sero-prevalence rate as compared to the other group (<41 hrs/week on duty). Table 2 summarizes the association between the sero-prevalence and potential risk factors.

Concerning HCV, only one female nurse in the age group of 30-39 years and one male midwife in the age group of 40-49 years were found to be HCV positive. However, apart from its lack of statistical significance (p= 0.921), HCV prevalence was found to be too infrequent to compare between demographic factors.

Table 2: Hepatitis B and C distributions per participants' demography

variables		Number of tested	HBV lab. results		p-value	HCV lab. results		p-value
			Screening test	Confirmatory test		Screening test	Confirmatory test	
			RDT **HBsAg+ve**	**ELISA** HBeAg +ve **PCR** HBV-DNA+ve		**RDT** Anti-HCV Ab+ve	**ELISA** HCV-RNA +ve	
		frq. (%)	frq. (%)	frq. (%)		frq. (%)	frq. (%)	
Age groups in years (yr)	20-29	153 (62%)	2(0.8%)	1(0.4%)	>0.05			0.47
	30-39	61 (25%)	4(1.6%)	3(1.2%)		1(0.41%)	1(0.41%)	
	40-49	23 (9%)	3(1.2%)	2(0.8%)		1(0.39%)	1(0.39%)	
	50-59	11 (4%)	2(0.7%)	1(0.4%)				
Gender	male	83 (33.5%)	6(1.6%)	4(1.6%)	0.073	1(0.4%)	1(0.4%)	0.618
	female	165 (66.5%)	5(1.2%)	3(1.2%)		1(0.4%)	1(0.4%)	
Marital status	married	145 (58.5%)	6(1.6%)	4(1.6%)	0.346	1(0.4%)	1(0.4%)	0.816
	Un married	103 (41.5%)	5(1.2%)	3(1.2%)		1(0.4%)	1(0.4%)	
Professional category	doctors	3 (1.2%)	-	-	>0.05	-	-	0.39
	Health officers	44 (17.7%)	-	-		-	-	
	nurses	129 (52.1%)	4(1.2%)	3(1.2%)		1(0.4%)	1(0.4%)	
	midwives	40 (16.1%)	3(0.8%)	2(0.8%)		1(0.4%)	1(0.4%)	
	Laboratory professional	24 (9.7%)	2(0.4%)	1(0.4%)		-	-	
	Traditional healers	8 (3.2%)	2(0.4%)	1(0.4%)		-	-	
Duration of Service in years	1-5	180 (72.6%)	2(0.8%)	2(0.8%)	>0.05	-	-	1.00
	6-10	40 (16.2%)	2(0.4%)	1(0.4%)		-	-	
	11-15	10 (4%)	2(0.8%)	2(0.8%)		1(0.4%)	1(0.4%)	
	16-20	10 (4%)	2(0.4%)	1(0.4%)		1(0.4%)	1(0.4%)	
	21-25	8 (3.2%)	2(0.4%)	1(0.4%)		-	-	
No. of Hrs On duty Per week	$\leq$ 40	146 (59%)	1(0.4%)	1(0.4%)	0.04	1(0.4%)	1(0.4%)	0.323
	41-50	40 (16%)	4(0.8%)	2(0.8%)		1(0.4%)	1(0.4%)	
	51-60	29 (12%)	3(0.8%)	2(0.8%)		-	-	
	>60	33 (13%)	3(0.8%)	2(0.8%)		-	-	

4.3. The knowledge of study Participants about HBV and HCV transmission and preventive strategies

A total of 16 questions were used to measure the level of participants' knowledge about hepatitis B and C virus transmission and preventive measures. The reliability (internal consistency) of the knowledge items was good (cronbach's alpha=0.786). As indicated in Table 3, an overall 206 (82.8%) of the study participants had adequate knowledge on hepatitis B & C mode of transmission and preventive measures. The mean knowledge score of the study participants as measured by the number of correctly answered questions out of the 16 was 13.3(SD $\pm$ 3.2).

In the study, most of the study participants(93.1%) knew viruses are the causative agents of hepatitis B & C, 235(94.7%) of HCWs correctly identified HBV and HCV can be transmitted through contamination with blood and body fluids, 198(79.8%) of them correctly identified transmission through contaminated needles stick and sharps injuries, 235(94.8%) of them knew hepatitis B and C can be transmitted through unsafe sexual intercourse and 223(89.9%) of them knew mother-to-child transmission. However, 17(6.9%) of them missed the correct etiologic agent of hepatitis B and C infections, 46(18.5%) of HCWs incorrectly identified that hepatitis B and C can be transmitted through close personal contact like talking or kissing with an infected person.

With regard to knowledge on the preventive ways of HBV and HCV, the majority number of the study participants (95.9%) knew that HBV and HCV could be prevented by consistent uses of PEP, 229(92.3%) of them knew HBV and HCV could be prevented by proper disposal of medical wastes. Among all, 244(98.4%) of HCWs knew availability of vaccine for the protection of HBV infection, 191(77%) of them knew three doses of anti-HBV vaccines are required for the complete protection of HBV infection. However, only 112(45.2%) of them correctly identify the standard vaccination schedule interval (0, 1 and 6 month) and only 147(59.3%) of HCWs knew absence of a vaccine for the protection of HCV infection. Regarding knowledge on treatment and management of HBV and HCV infection, 211(85%) of participants knew the availability of treatment option on western medicine to threat HBV and HCV infection, 193(78%) knew availability of post exposure prophylaxis (PEP) to manage post exposure HBV infection.

A one-way ANOVA analysis was run to check whether there is variability in terms of knowledge scores between the professional groups. Accordingly, the results had shown the existence of

significant variability in terms of knowledge between the professional groups (F5, 102 = 11.48, P = 0.0001).By profession, doctors were with the highest (14.7) mean knowledge score out of 16 possible correct answers, followed by health officers (14.2), laboratory professionals (14), midwives (13.3), nurses (13); and the traditional healers were with the least (6) mean knowledge score. In addition, a chi-square test of independence was performed to examine the relation between knowledge score and the socio-demographic variables. As a result, only educational background (X^2=8.356, p=0.015) and type of profession (X^2= 21.156,p=0.007) were found to be significant determinant factors for good knowledge scores among the study participants.

Table 3: percentages of correct responses for knowledge questions b/n professional groups

Knowledge questions	Type of profession						
	MD (n=3)	**HO** (n=44)	**NS** (n=129)	**MW** (n=40)	**LP** (n=24)	**TH** (n=8)	Total (n=248)
	Yes fr.(%)	Yes fr.(%)	Yes fr.(%)	Yes fr.(%)	Yes fr.(%)	Yes fr.(%)	Yes fr.(%)
Hepatitis B and C are caused by a virus	3 (100)	44 (100)	122 (94.56)	36 (90)	24 (100)	3 (37.5)	231(93.1%)
Liver is the main organ affected by HBV and HCV	3 (100)	44 (100)	126 (97.7)	40 (100)	24 (100)	8 (100)	243(97.9%)
HBV and HCV can caused liver cancer	3 (100)	38 (86.4)	87 (67.4)	26 (65)	16 (66.7)	2 (25)	172(69.4%)
Hepatitis B & C can be transmitted through infected blood and body fluids	3 (100)	44 (100)	120 (93)	40 (100)	24 (100)	4 (50)	235(94.7%)
Hepatitis B & C can be transmitted through needle stick or sharp object injury	2 (66.7)	38 (86.4)	96 (74.4)	36 (90)	24 (100)	1 (12.5)	198(79.8%)
Hepatitis B & C can be transmitted through unsafe sexual intercourses	3 (100)	44 (100)	123 (95.3)	38 (95)	24 (100)	4 (50)	235(94.8%)
Hepatitis B & C can be transmitted from mother to child during pregnancy	3 (100)	44 (100)	114 (88.4)	39 (97.5)	22 (91.7)	2 (25)	223(89.9%)
Hepatitis B & C can be transmitted By traditional tattoo practice	3 (100)	31 (70.5)	79 (61.2)	29 (72.5)	18 (75)	3 (37.5)	163(65.7%)
Hepatitis B & C can be prevented Proper use of personal protective equipment	3 (100)	44 (100)	125 (96.9)	37 (92.5)	24 (100)	3 (37.5)	238(95.9%)
Hepatitis B & C can be prevented by proper disposal of sharps and medical wastes	3 (100)	38 (86.4)	123 (95.3)	35 (87.5)	24 (100)	2 (25)	229(92.3%)
Hepatitis B & C can be prevented by avoiding multiple sexual partners	3 (100)	44 (100)	126 (97.7)	37 (92.5)	18 (75)	5 (62.5)	231(93.1%)
there is a vaccine to prevent hepatitis B infection	3 (100)	44 (100)	129 (100)	40 (100)	24 (100)	6 (75)	244(98.4%)
There is no vaccine so far for the prevention of hepatitis C infection	2 (66.7)	33 (75)	66 (51.2)	22 (55)	20 (83.3)	3 (37.5)	147(59.3%)
There is treatment/ PEP for HBV	3 (100)	44 (100)	96 (74.4)	29 (72.5)	19 (79.2)	2 (25)	193(77.8%)
Three doses of anti-HB vaccines are required for the full protection against HBV infection	2 (66.7)	36 (81.8)	98 (75.9)	33 (82.5)	21 (87.5)	1 (12.5)	191(77%)
0,1 and 6m is the proper anti-HBV vaccination schedule in adults	1 (33.3)	18 (40.9)	69 (53.5)	13 (32.5)	11 (45.8)	0 (0)	112(45.2%)
Total	43 (90%)	628 (89%)	1699 (82%)	530 (83%)	337 (88%)	48 (38%)	**3285(82.8%)**
Total mean knowledge score	14.4	14.24	13.1	13.28	14.08	6.08	**13.2**

n = number of participants, MD = medical doctor, HO= health officers, NS = nurse, MW = midwives, LP= lab professionals & TH = traditional healers

4.4 Attitude or perception of study participants towards occupational risks of HBV and HCV infections

Seven attitude questions based on the five level likert scales of measurement (strongly agree, agree, strongly disagree, disagree, and neutral) were used to assess the study participants' perception towards occupational risks of HBV and HCV infection. The reliability or internal consistency of the attitude items was good (cronbachs' alpha=0.777). As shown in Table 4, an overall 64% of the study participants had positive attitude towards hepatitis B and C infection. The mean positive attitude score among all the study participants was 4.5 ±0.2 SD out of 7 possible good attitude scores.

In the study, only 182(73%) of them felt that they were at risk and strongly agreed they can acquire hepatitis by virtue of their occupation. In addition, 114 (46%) of HCWs strongly believed that sero-positive HCWs could be also the potential source of hepatitis infection for patients. The majority of (84%) study participants had positive perception about anti-HBV vaccination; and 201(81%) of them strongly agreed on the effectiveness of PEP after exposure. However, only 88 (35%) of the study participants had positive perception on the importance of serum antibody level checkup after anti-HBV vaccination; only 164(66%) of them had strongly agreed on the need for regular blood checkup for hepatitis; and only 146(59%) participants strongly agreed on the need for immediate reporting after occupational exposure.

All over, significant variability was not seen and the difference in the mean attitude scores was not significant ($F_{5, 102} = 0.58$, $p = 0.676$). The detailed attitude scores by each professional group are shown in table 4.

Table 4: percentages of positive attitude scores b/n professional groups

Attitude questions	Professional category						
	MD (n=3)	**HO** (n=44)	**NS** (n=129)	**MW** (n=40)	**LT** (n=24)	**TH** (n=8)	**total** (n=248)
	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	
Your occupation may lead you exposed for hepatitis infection	2	28	98	31	19	4	182 (73%)
Sero positive health care workers can be a potential source of hepatitis infection	2	27	56	15	11	3	114 (46%)
anti-HBV vaccines are effective and safe to prevent HBV infection	3	40	109	32	20	4	208 (84%)
Immunity level check up is important after anti-HBV vaccination	2	13	44	16	11	2	88 (35%)
HBV post exposure prophylaxis can reduce the likelihood of being positive after exposure	3	38	102	33	21	4	201 (81%)
Regular blood testing is important to prevent occupational risks of HBV and HCV infection	2	28	91	26	14	3	164 (66%)
Immediate reporting is mandatory after exposed to occupational risk factors	3	31	71	21	16	4	146 (59%)
Total positive attitude scores	17	205	571	174	112	24	1103 (64%)
Mean positive attitude score	5.7	4.7	4.4	4.3	4.7	3	4.5

n = number of participants, MD = medical doctor, HO= health officers, N = nurse, MW = midwives, LP = lab professionals & TH = traditional healers.

4.5 Frequencies of occupational exposures and hepatitis preventive practice of study participants

Despite having good level of knowledge (82.8%) about HBV and HCV, the preventive practice score was found to be poor among the study participants. The mean preventive practice score was 43% $\pm$ 5 SD ranging from the highest 67% scored by medical doctors to the least 13% scored by traditional healers. Among the 248 study participants, only 155 (62.5%) of them had a history of vaccination against HBV and out of these only 62(25%) were fully vaccinated. The rest 93(37.5%) were unvaccinated. Among those who had a history of vaccination, only 7(2.8) of them had done serum antibody level test after anti-HBV vaccination. The vaccination status of study participants is depicted on Table 5.

Compliance of the participants to universal safety precautions was assessed to measure their preventive practice including; consistent uses of PPE, proper disposal of medical wastes and frequent reporting of occupational exposures. Among the 248 study participants, consistent uses of personal protective equipments (glove, gown, face mask...) were applied by only 109 (44%) of participants and only 129 (52%) of them were found to dispose medical wastes properly. Concerning frequencies of occupational exposures, the overall exposure rate for different risk factors was 56% among all the study participants in the past three years. One hundred and ninety-seven (79%) exposures for blood, 138(56%) for body fluids, 155(63%) sharp injuries and 67(27%) needle stick injuries were reported by the study groups. Overall, highest frequencies of occupational exposure was seen among nurses (62%) followed by midwives (58%), laboratory professionals (52%), traditional healers (50%), health officers (43%) and doctors (42%).Among all HCWs who had a history of occupational exposures, only 90(36.3%) of the study participants had found to report their incidences of occupational exposures and only159(64%)of them had a regular blood test to check up their serological status.

Among all the study participants, only144 (58%) of them got infection prevention training. Hence, a one-way ANOVA showed that there was significant difference between the professional groups in terms of preventive practice ($F_{5, 102} = 4.10$, $P = 0.004$). The post-hoc LSD test showed that HCWs had significantly higher practice score than traditional healers ($P = 0.009$). But there is no significant difference between inter professional groups within HCWs ($P>0.05$).The mean preventive practical scores and frequencies of occupational exposure are shown on Tables 6 and 7, respectively.

Table 5: Vaccination profiles of the study participants

Doses of vaccine taken	Types of profession						
	MD (n=3)	**HO** (n=44)	**NS** (n=129)	**MW** (n=40)	**LP** (n=24)	**TH** (n=8)	Total (n=248)
0 doss (never been vaccinated)	-	15	49	13	9	7	93(37.5%)
1 doss (uncompleted)	-	6	24	7	3	1	41(16.5%)
2 doses (uncompleted)	2	7	30	8	5	-	52(21%)
3 doses (completed)	1	16	26	12	7	-	62(25%)

Table 6: Hepatitis B and C preventive practice among the study participants

Practice questions	Professional category						
	MD (n=3)	**HO** (n=44)	**NS** (n=129)	**MW** (n=40)	**LT** (n=24)	**TH** (n=8)	**total** (n=248)
	yes	yes	yes	yes	yes	yes	
Frequent use personal protective equipments(glove, gown, masks…etc.) during medical procedures	2	21	53	18	12	3	109 (44%)
Consistent and proper disposal of medical wastes after use	3	26	49	30	19	2	129 (52%)
Habit of immediate reporting after occupational exposure for risk factors	1	18	37	15	19	0	90 (36.3%)
serum antibody level testing after anti-HBV vaccination	1	3	2	0	1	0	7 (2.8%)
Regular laboratory screening test for HBV and HCV	3	29	80	27	19	1	159 (64%)
Attending at infection prevention training	2	41	67	19	15	0	144(58%)
Total good practice score	12	138	288	109	85	6	638
Mean good practice score	67%	52%	37%	45%	59%	13%	(43%)

Table 7: Frequencies of occupational exposure among the study participants

Types of Exposures	Types of profession						
	MD (n=3)	**HO** (n=44)	**NS** (n=129)	**MW** (n=40)	**LP** (n=24)	**TH** (n=8)	Total (n=248)
	Frq.	Frq.	Frq.	Frq.	Frq.	Frq.	Frq.(%)
needle stick injury	1	3	35	10	12	6	67(27%)
sharp injury	1	13	101	14	21	5	155(62.5%)
blood exposure	2	27	110	36	17	5	197(79.4%)
body fluid exposure	1	32	73	32	0	0	138(55.6%)
Total Frq.(%)	5(42%)	75(43%)	319(62%)	92(58%)	50(52%)	16(50%)	517(56%)

n = number of participants, MD = medical doctor, HO= health officers, N = nurse, MW = midwives, LP = lab professionals & TH = traditional healers.

4.6 Factors associated with good knowledge and preventive practice

A chi-square test was performed to examine the association between the socio-demographic factors and the knowledge scores of the study participants. The univariate analysis showed that only participants' education level (X2=8.356, p=0.015) and type of profession (X2= 21.156, p=0.007) were found to have significant association with overall knowledge score. Relatively higher numbers of study participants in the educational level of degree and above were found to have higher level of knowledge score than subjects with diploma and below educational background. As to profession type, doctors were found to have the highest knowledge score (90%) and THs were found to have the least knowledge score (38%). However, on the multivariate analysis of logistic regression model, only educational level of the study participants remained the only predictor for good knowledge level.

A logistic regression analysis was also conducted to identify predictors for good hepatitis preventive practice among the study participants. When binary logistic regression was run separately for each predictor (Bivariate analysis); length of working hours per week [OR=2.6 (95% CI=1.3-5.1)],work experience [OR=6.2 (95% CI=2.3-16.4)] and history of infection prevention training [OR=2.9 (95%C=1.4-5.7)] were found to be significant predictors of good preventive practice. However, on multivariate analysis only history of training made a significant contribution to prediction (P=0.025). In this regard, the study participants who had history of training on infection prevention were 2.8 times preventive than those who didn't have history of training.

4.7 Risk factors associated with HBV and HCV infection

With regard to HCV sero-prevalence, none of the demographic variables and factors associated with the KAP of the study participants was found to have significant association with HCV sero-prevalence. However, some risk factors from the demographic variables and factors associated with the KAP of the study participants were found to have significant associations with the sero-prevalence of HBV. Among the demographic factors, the study participants' length of working time per week was found to have had significant association (COR = 9.06, P= 0.043) with HBV sero-prevalence by univariate analysis, where the risk of HBV infection was found to be 9 times higher among the study participants who spent more than 40 hours per week; six of the seven HBV positive cases were found among HCWs who spent more than 40 hrs per week.

Among factors associated with practices of the study participants, noncompliance to USP (COR= 9.548; P= 0.038), needle stick injury (COR= 7.22; P= 0.02) and UN vaccination (COR= 10.62; P= 0.03) were found to have had significant association with HBV sero-prevalence by univariate analysis of our study. However, the knowledge and attitude of the study participants were not found to have significant association with HBV sero-prevalence. In this connection, the odds of HBV infection were 9 times higher among HCWs who did not use gloves (applied USP) than those who used; and 6 of 7 HBV positive cases were detected among HCWs who did not use gloves on duty. The risk of HBV infection was 7 times higher among HCWs who were exposed to needle stick injuries than who were not; and 5 of 7 positive cases were detected among HCWs who had encountered needle stick injuries in the past three years. Un-vaccination was the other significant risk factor for HBV infection and the risk was found to be 10 times (6/7) higher among HCWs who did not have a history of vaccination than who had.

Finally, a multivariate logistic regression analysis was run to control the effects of confounding factors and identifies predictor risk factor directly associated with HBV sero-prevalence. As a result, UN vaccination remained the only significant risk factor associated with HBV infection following multivariate logistic regression analysis (OR = 4.092; 95%; P = 0.039). Table 8 summarizes these findings.

Table 8: significant risk factors for HBV infection

Risk factors		HBV Prevalence (%)	COR ratio	95% CI	P value
Age groups		7(2.8%)	1	0.120-3.388	0.162
Professional category		7(2.8%)	1	0.233-4.86	0.345
sex	male	4(1.6%)	2.734	0.597-12.513	0.195
	female	3(1.2%)	0.366	0.079-1.674	0.195
Positive attitude	yes	4(1.6%)	0.946	0.207-4.318	0.943
	no	3(1.2%)	1.058	0.232-4.829	0.943
Knowledge On UPS	yes	6(2.4%)	0.233		
	no	1(0.4%)	4.296	0.467-39.529	0.198
Consistent use of glove	Yes	1(0.4%)	0.105		
	No	6(2.4%)	9.548	1.132-80.579	0.038
Blood exposure	yes	5(2%)	0.638	0.120-3.388	0.598
	no	2(0.8%)	1		
Body fluid exposure	yes	4(1.6%)	1.065	0.233-4.86	0.936
	no	3(1.2%)	0.939		
Needle stick injury	Yes	5(2%)	7.2177	1.365-38.154	0.02
	No	2(0.8%)	0.1385		
Sharp injury	yes	4(1.6%)	0.7947	0.174-3.632	0.767
	no	3(1.2%)	1		
History of vaccination	Yes	1(0.4%)	0.094	0.0112-0.7949	0.0299
	No	6(2.4%)	10.621	1.258-89.67	0.0299
Length of hours on duty	≤ 40 hours	1(0.4%)	0.1103	0.013-0.931	
	> 40 hours	6(2.4%)	9.0625	1.074-76.465	0.043

Chapter five- Discussion

This cross-sectional study was conducted from November, 2017 to January, 2019 to investigate the magnitudes of Hepatitis B and C virus infections and related risk factors among the HCWs and traditional healers at selected study sites of Kolfe-Keraniyo sub city in Addis Ababa, Ethiopia. Random selection was one of the multi stage sampling techniques desired to be used to select study participants in this study. However, random selection of study participants was found very difficult since enrollment to participate in the study was largely on voluntary basis. Volunteer sampling has the potential of introducing selection bias where subjects who knew their status and high-risk group may refrain from participation (Thrusfied, 1995).

Generally, great effort has been made to avoid this selection bias and proportionate numbers of study participants from each at risk professional groups including; physicians, HO, Nurses, midwives, Lab and THs were included. Furthermore, the response rate (95.4%) of our study was good enough to study risk difference in the prevalence of HBV and HCV between varieties of professional groups.

5.1HBV and HCV Sero-Prevalence

I. HBV

Although significant difference(p=0.841) was not seen from the hypothesized HBV mean prevalence (5.6%), our result on HBV prevalence(2.8%) was still in the ranges of an intermediate (2-7%) prevalence according to the WHO's rank of HBV endemicity (ECDC**,** 2012**;** Zampino et al**.,** 2015). A comparable intermediate (2-7%) prevalence of HBV was reported among the HCWs by different recent studies from Ethiopia. For example, similar intermediate result of HBV prevalence (2.4%) was reported by Akalu et al., (2016) among hospital HCWs in Addis Ababa and a 2.6% of HBV prevalence was reported by Desalegn and Gebre-Selassie **(**2013) among the HCWs in Addis Ababa Ethiopia. In addition, our result was comparable with an intermediate result (2.5%) of HBV prevalence reported by Habtemu et al, (2019) among the HCWs at Jima university southwest Ethiopia. Similarly, intermediate results of HBV prevalence had been reported among the HCWs by different prevalence studies from different countries. For instance, a recent prevalence study conducted in Sudan had shown 4.9% prevalence of HBV among the HCWs(Elduma and Saeed**,** 2011**)** and anther prevalence study from Turkey had shown a 5% of HBV prevalence among the HCWs (Kosgerogluet al**.,** 2004).

In contrast, our result on HBV prevalence rate (2.8%) was almost triple fold lower than the prevalence rate of HBV reported by the previous hospital based studies from Addis Ababa Ethiopia. For example, the prevalence study conducted by Kefenie et al. (1989) revealed a 9.7% prevalence of HBV among 350 hospital HCWs in Addis Ababa. In addition, the prevalence study conducted by Seid (2005) had shown a 9.02% prevalence of HBV among 300 HCWs at Black lion and Ras Desta hospitals in Addis Ababa. Furthermore, our result was much lower as compare to the prevalence studies conducted in other countries. For instance, the prevalence study from Yemen, a highly HBV endemic country, had shown a 9.9% prevalence of HBV among the HCWs (Shidrawiet al., 2004). Another prevalence study from Senegal had shown 17.8% of HBV prevalence (Romieuet al**.,** 1989) and the study conducted in Uganda had shown 8.1% of HBV prevalence among the HCWs (Ziraba et al.2010).

Generally, it was very difficult to have an accurate and complete explanation for this big difference of HBV prevalence from the previous studies in Ethiopia. However, the lower rate of HBV prevalence in our study could be probably due to difference in the study settings. Since our study groups were HCWs from primary health care (health centers) settings where only primary level of medical services are provided, participants might have less likely chance to be exposed for infectious with biological materials as compared to HCWs who worked in the hospitals. The smaller sample size used by this study could also be the other possible explanation for lower result of HBV prevalence by the present study.

Another possible reason for lower rate of HBV prevalence in our study could be the difference in the serological markers used to screen HBV infection. In our study, detection of HBsAg was the only serological marker used to screen for HBV infection by rapid screening test kits. However, the previous studies (Seid, 2005; Kefenie et al., 1989) had incorporated detection of anti-HBcAg antibodies in addition to detection of HBsAg among their study participants. Since at the early stage of acute infection or during window period, HBsAg is in un- detectable level, detection of anti-HBcAg antibodies can be used in addition to antigen tests because these antibodies are the only HBV serological markers detected during this period (Mel et al, 2005). There is also another possibility of missing HBV infection as the result of using HBsAg marker for screening, i.e., during occult HBV infection. In this case HBsAg is a poor biomarker for screening since surface antigen will be undetectable (WHO, 2017) due to low viral replication and gene expression (Pollicino et al., 2007) during chronic HBV infections. Therefore, a screening test

which relay only on the detection of HBsAg may have higher probability to Miss HBsAg at the early periods of HBV infection unless otherwise they are most sensitive antigen tests like ELISA. Moreover, the lower HBV prevalence rate in our study could probably be due to the actual decreasing in the risks of HBV infection among the HCWs, since some remarkable progress has been made nowadays in regards to strategies to protect HCWs from occupational risks of blood borne pathogens like hepatitis (Pruss et al, 2005). This can be evidenced by the above reports of similar intermediate HBV prevalence results by the recent studies from Addis Ababa and different regions of Ethiopia (Akalu et al., 2016; Desalegn and Gebre-Selassie,2013; Habtemu et al, 2019).

II. HCV

Concerning HCV, only two confirmed HCV positive cases were detected and the prevalence was found to be 0.8% among the study participants. This rate of HCV prevalence (0.8%) is considered to be very low according to the WHO's cut off ranking for HCV endemicity (ECDC, 2012). Our finding on the prevalence rate of HCV was comparable with the prevalence rates (0.42%) reported by Habtemu et al., (2019) among the HCWs in Jima University south west Ethiopia and the prevalence rate (0.7%) reported by Demsiss et al., (2018) among medicine and health science students at Wollo University, Ethiopia. In addition, our low result was comparable with the prevalence rates (0.4%) reported by Seid (2005) among the HCWs of Ras Desta and Tikur Ambesa hospitals in Addis Ababa, Ethiopia. However, our study was too limited to use it for comparison, and there was a lake of other research reports on the prevalence of HCV among HCWs in Ethiopia.

However, compared to prevalence rate reports from other studies abroad, ours was much lesser. For example, 1.2% of HCV prevalence rate was reported among the HCWs from Italy (Campello et al., 1992), 3.5% from Yemen (Shidrawi et al., 2004). In addition, our HCV prevalence rate (0.8%) was much lower than the rate of HCV prevalence (2%) reported even by a population-based study in Ethiopia (Frommel et al., 1993). This very low rate of HCV prevalence in the present study despite the presence of high occupational exposures among HCWs is striking. However, the presence of low HCV prevalence in the general population of Ethiopia (Frommel et al., 1993)could be the possible explanation for observing lower HCV prevalence in the present study.

5.2 Risk Factors Associated with HBV and HCV Sero-prevalence

I. HBV

Although significant risk difference was not seen between the sex groups(P= 0.073), HBV prevalence was comparatively higher among male (1.6%) than female (1.2%) study participants in our study, as was reported from Sudan (Nail et al, 2008) and Pakistan (Nazetal, 2002**).** Generally, it was very difficult to give a complete explanation for this difference since significant exposure difference was not seen between male and female study participants. However, the smaller number of male participants could be the possible reason for this apparently higher prevalence of HBV among male study participants in our study. Previous studies from Ethiopia (Akalu et al, 2016; Abebe et al, 2003) and India (Joyee et al, 2005) had also reported similar results of higher HBV prevalence among males HCWs than females.

In the present study, although significant difference was not seen between the age groups (P>0.05), age-specific HBV prevalence progressively increased as the ages of the study participants increased. Age-specific HBV prevalence was comparatively higher among the HCWs in the age groups of 30-39(1.2%) and 40-49(0.8%). Length of service year on occupation could be the best reason for this higher prevalence of HBV among the HCWs in these age groups. Since the HCWs in these groups of age have longer service years (>5), they have higher incidences of occupational exposures as compared to the HCWs who had less service years (<5). This result was similar with those reported from Ethiopia (Desalegn and Gebre-Selassie, 2013; Seid, 2005) and India(Asok et al., 2000). Although significant difference was not seen in HBV prevalence between professional groups **(**P>0.05**)**, it was relatively highest among nurses **(**1.2%)in our study. The possible reason for this could be associated with the high occupational exposures rate among nurses since nurses had the highest rate of exposure (62%) from among all professional categories.

Similar prevalence studies from Ethiopia (Desalegn and Gebre Selassie, 2013), Morocco (Djeriri et al, 2008) and Sudan (Nail et al, 2008) had also shown nurses to be the most affected professional groups with occupational HBV infection. However, laboratory professionals and midwives were also the frequently mentioned professional groups affected by occupational HBV infection by other studies (Habtemu et al., 2019**;** Demsiss et al., 2018). In the present study, the THs were also one of HBV affected professional groups despite although with very low rate

(1/8or12.5%). However, the smaller number of participants from the THs could be the best reason for this low rate of HBV prevalence in our study.

Generally, from demographic factors, only prolonged length of working hours per week was found to be a significant risk factor associated with HBV infection. Frequencies of occupational exposures were associated with spending prolonged working hours on duty without sufficient rest. In line with this, reports show that HCWs have higher potential to be exposed for occupational infectious blood borne pathogens due to work stress (Perry et al, 2004; Fisman et al, 2007). In our study, six of seven (85.71%) HBV positive cases were identified among the 102 study participants who had spent more than 40 hours on duty per week. Furthermore, more than 70% of occupational exposures were reported by these groups of the HCWs. In this connection, tremendous risk difference was observed in HBV infection where it was 9 times higher among the HCWs who spent more than 40 working hours per week as compared to the HCWs who spent 40 working hours or less per week(COR = 9.06, P= 0.043). These findings were similar with findings from America **(**Fisman et al, 2007**)** and Africa **(**Asa et al, 2017**).**

In addition to this, none compliance to universal safety precaution measures (COR**=** 9.548; P= 0.038), exposure for needle stick injuries (COR= 7.22; P= 0.02) and none vaccination (COR= 10.62; P= 0.03) were found to be significant risk factors associated with HBV infection by univariate analysis of our study. Compliance to universal safety precaution measures like using PPE, proper disposal of medical wastes and prompt reporting of occupational exposures are fundamental for the HCWs to prevent occupational risks of infectious blood borne pathogens like hepatitis. The risk of infectious blood-borne pathogens is proven highest among the HCWs who didn't apply universal safety precaution measures at their working place (Castello et al, 2003). The data from the present study showed the same, where six of seven HBV positive cases were identified among the HCWs who did not apply USP measures at their working place, and not surprisingly the risk of HBV was found to be nine times higher among them. Similar prevalence study from Ethiopia had also shown five of six HBV positive cases were detected among the HCWs who did not apply safety precaution measures on their work place (Desalegn and Gebre-Selassie, 2013).

Needle stick and sharp injuries are the common workplace accidents among most of the HCWs and they are the frequently mentioned significant risk factors for occupational infectious blood borne pathogens like hepatitis. The risk of HBV infection was estimated to be 6-30% after NSI

exposures among the susceptible HCWs without post exposure prophylaxis or sufficient anti-HBV vaccination (Deisenhammer et al, 2006**;** Wicker and Rabenau, 2011). This was found true in our study where five out of seven HBV positive cases were detected among the susceptible (unvaccinated) HCWs who had a history of needle stick injuries. The risk of HBV infection was found to be 7 times higher among those five participants who had a history of needle stick injuries than who hadn't. Similar study from Ethiopia had also shown five out of six HBV positive cases occurred among unvaccinated HCWs who had a history of needle stick injuries (Desalegn and Gebre Selassie, 2013). In addition, the study from Pakistan had shown that tremendous amount (66%) of HBV positive cases identified among the susceptible HCWs who had experienced needle stick injuries (Morshad et al, 2009). This shows how needle stick injuries are significant risk factors for occupational transmission of blood borne pathogens like hepatitis. Yet, needle stick injuries are still the common mistakes of negligence among most HCWs despite the fact that about 74% of injuries from needle stick can be prevented through safety precaution measures (Castello et al, 2003).

Studies have confirmed that the risk of occupational HBV infection was higher among the HCWs without proper anti-HBV vaccination and post exposure prophylaxis (CDC, 2003). Consistent with this, the finding in our study showed that lack of anti-HBV vaccination was the other risk factor found significantly associated with HBV infection by univariate analysis. In fact, lack of anti-HBV vaccination was also the only predictor risk factor that remained significant **(**OR = 4.092; P = 0.039**)** after exclusion of other confounding factors through a multivariate logistic regression analysis. Six out of seven HBV positive cases were identified among the HCWs who had not a history of anti-HBV vaccination, and the odds of being HBV positive was found to be 10 times higher among unvaccinated HCWs. Similar studies from Ethiopia and other countries had also shown lack of anti-HBV vaccination to be independent risk factor potentially associated with hepatitis-B infection after **a** multivariate logistic regression analysis.. For example, the prevalence study conducted by Akalu et al (2016) showed a 2.6% prevalence of HBV infection among the HCWs who had no history of anti-HBV vaccination; and lack of anti-HBV vaccination was the only independent risk factor that was significantly ($\chi 2= 11.145$, $p < 0.002$) associated with hepatitis-B infections (Akaluet al., 2016).Similarly, the study conducted by Seid (2005) found out a 9.7% (95% CI: 6-13.2%) of HBsAg detection rate among unvaccinated; and absence of anti-HBV vaccination was the only risk factor associated

with hepatitis B infection (p=0.001). In addition, the study from India revealed that, although 42% of the HCWs had received a partial or full course of anti-HBV vaccination, the difference in HBV positivity was significantly higher (P<0.001) among the HCWs who had no a history of anti-HBV vaccination (Asok et al, 2000), showing that even a partial course of anti-HBV vaccination could better protect workers compared to no vaccination.

II. HCV

With regard to HCV, neither the demographic variables nor factors associated with the KAP were found to have significant association with HCV in our study. It was very striking to have such finding in the presence of high occupational exposures among the study participants. Nevertheless, the lower rate of HCV detected could be the best reason for this absence of risk factors that significantly associated with HCV in the present study. The previous studies from Ethiopia had also shown similar results and reveal none of job-related risk factors were significantly associated with HCV among their HCV positive cases (Habtemu et al., 2019; Seid 2005). However, high rates of HCV prevalence that associated with job related risk factors had been shown by different studies from other countries. For example, prevalence study from Italy had shown 1.2% of HCV prevalence rate as identified among the HCWs who had experienced needle stick and sharp injuries (Campello et al., 1992). In addition, the study from Yemen had shown a 3.5% of HCV detection rate among the HCWs due to needle stick exposures (Shidrawi et al., 2004).

5.3 The Knowledge, Attitude and Practice of the Study Participants

A. KAP study of mainstream HCWs

The mainstream Health care workers are expected to have adequate knowledge of hepatitis transmission and prevention methods by virtue of their conventional education and medical trainings. However, some previous studies from Ethiopia (Abeje & Azage, 2015; Gashu**,** 2015) and other countries (Moghimies et al**.,** 2008; Stein et al, 2003) reported tremendous knowledge gap that could be the potential source of occupational exposures among the HCWs. In our study, about 84.3% of the allopathic HCWs were found to have good knowledge of HBV/HCV transmission and preventive strategies. This finding of our study was considered to be higher as compared to the previous studies from Ethiopia (Desalegn and Gebre-Silase**,** 2013; Abeje & Azage, 2015; Gashu**,** 2015) and Iran (Moghimies et al**.,** 2008). Hence, it would not be surprising given the recent trend of such high knowledge score reporting from other studies in Ethiopia like

the ones by Habtemu et al. (2019), Demsiss et al. (2018), and Akalu et al. (2016). This shows how remarkably progresses have been made on the awareness of the HCWs because now days the potential risks of HBV and HCV infection is increasing especially among the HCWs in the developing world (Pruss-Ustun et al, 2005).

On the other hand, our finding on the HCWs' risk perception(attitude) and their practical hepatitis preventive practices were not found good enough regardless of having good level of knowledge about hepatitis transmission and preventive strategies. Sometimes a good knowledge could not be translated in to positive perception and having a positive attitude may not guarantee good practice (Castello et al, 2003). As a result, although there is evidence of having adequate knowledge of the occupational risks of infectious pathogens, most HCWs are still exposed to infectious pathogens because of their poor perception or underestimating the potential risks of occupational infectious pathogens (Castello et al, 2003).This was in agreement with our finding because regardless of having good knowledge on occupational risks of HBV and HCV, only 55.2% of the HCWs were found to have perceived their being at risk in acquiring hepatitis by virtue of their occupation. Although this finding was similar to other studies' findings from Ethiopia(Gashu**,** 2015; Abeje & Azage, 2015) and elsewhere in other countries such as Bangladesh(Mehriban et al, 2015), risk perception rate in our study was unacceptably very low considering.

Apart from the HCWs' risk perception, sticking on universal safety precaution measures is fundamental for the HCWs to prevent occupational risks of blood borne pathogens (Castelloetal**,** 2003). Yet, most HCWs are still shown to be exposed as a result of their poor preventive practice despite they have adequate knowledge of preventive measures for occupational infectious pathogens (Castello et al, 2003**;** Pruss-Ustun et al, 2005). This was also found to be true in our study because regardless of having good knowledge of hepatitis preventive strategies, only 60 (43%) out of 240 HCWs were found to have good hepatitis preventive practice through regular adoption of universal safety precaution (USP)measures at their working place.

Regarding blood testing and anti-HBV vaccination coverage, in our study about 64.2**% (**150) of the HCWs were found to know their HBV and HCV serological status through laboratory screening and found to have a history of anti-HBV vaccination. However, only 62(25.8%) of the HCWs completed the entire serious of anti-HBV vaccination in our study. Although our finding on the overall blood testing and anti-HBV vaccination coverage had shown some remarkable

progress from the previous similar studies in Ethiopia (Seid**,** 2005**;** Desalegn and Gebresilase**,** 2013; Akalu et al, 2016), the gross anti-HBV vaccination coverage (64.2**%**) and the proportion of HCWs who completed the entire course of anti-HBV vaccination (25.8%) were much less in contrast to the studies even from HBV less endemic countries. For example, studies from HBV low endemic countries like Iran (Bahmani et al, 2010) and Saudi Arabia (Jefferson et al, 2005) reported completed immunization coverage among the HCWs rate in the magnitude of 86.4% and 84%, respectively. In addition, our result was even lesser than the reported rate from neighboring Egypt which reported 38% complete anti-HBV immunization coverage among the HCWs (Talaat et al, 2003). However, the best reason for high unvaccination rates in our study could be inaccessibility of ant-HBV vaccine since this was the frequently mentioned reason by most of HCWs similar to the previous studies in Ethiopia (Seid**,** 2005**;** Desalegn and Gebresilase**,** 2013; Akalu et al, 2016). This show the issues of immunization is still a big challenge among the HCWs in Ethiopia.

Another striking finding in our study is; although about 150(64.2%) of HCWs had a history of anti-HBV vaccination, only 7(2.9%) of them were found to have checked their serum antibody level to evaluate their immune response after vaccination. This result is inconsistent with CDC's immunization guidelines which stated that serum antibody testing is mandatory after anti-HBV vaccination, since about 5 to 10 % of those vaccinated will fail to show immunity against HBV (CDC, 2001). Our finding is in agreement with results from studies done in Ethiopia and Libya, where none of them HCWs surveyed reported immunity testing after vaccination (Gashu, 2015; Noaman et al**.,** 2012). In contrast, better score was reported from a study in Pakistan, another developing nation, where about 60% of study participants undertook serum antibody testing after vaccination (Rana et al**.,** 2000). Missing the immunity check after vaccination among the HCWs especially in the developing world could be related to very limited availabilities of laboratory centers to measure the immunity level and probably the poor awareness of the HCWs about its importance (CDC, 2001; Gashu, 2015; Noaman et al., 2012).

In the present study, only 44% of the HCWs were found to use gloves consistent and 52% of the HCWs were found to dispose medical wastes properly. Our findings on the rate of consistent glove use and proper medical waste disposal are lesser than the rate of safety precaution measures reported by the previous similar KAP studies from Ethiopia. For instance, the KAP study conducted by Desalegn and Gebresilase, **(**2013) had revealed59.8% and 67% prevalence of

consistent glove uses and proper medical waste disposal system respectively among the HCWs in Addis Ababa. Another study by Gashu **(**2015**)** had shown 72% prevalence consistent glove use and 62% prevalence of safe medical disposal system among the HCWs**.** The possible explanation for this lower rate of safety precaution measures among the HCWs in our study could be associated with the risk perception observed and limited accessibilities of PPE materials, less accessibilities of materials for waste disposal system and lack of infection intervention centers in the health care facilities, showing the tremendous gap in the infection prevention efforts and the multidimensional challenges HCWs face to protect themselves from occupational infectious blood-borne pathogens like hepatitis.

Concerning frequencies of occupational exposures, the overall rate for occupational exposures in the past three years in this study among the HCWs was 56%, which is much lower than reports from previously conducted similar KAP studies in Ethiopia. For example, the studies by Seid**, (**2005**)** and Desalegn and Gebresilase, (2013**)** reported 83% and76% overall exposure rate, respectively Even this low exposure rate, is not good enough compared to previous other reports, where38% **(**Akalu et al.. 2016) and 43% (Habtemu et al., 2019)occupational exposures were from Addis Ababa and Southwest Ethiopia, respectively**.** However, the apparently lower exposure rate in our study and the latter two reports may not reflect the actual reduction of exposures among the HCWs; rather it could be due to the prevalence of higher underreporting rate for incidences of occupational exposure by the HCWs because undocumented reports are likely to be forgotten. In fact, only 36% (86) of the HCWs in our study were found to have reported their incidences of occupational exposures, showing the lower importance HCWs have given to the need for immediate reporting after exposures.

In the present study, nurses were leading in occupational exposure rate among all professional groups having the overall prevalence of 62% followed by midwives (58%), laboratory professionals (52%), traditional healers (50%), health officers (43%)and doctors (42%). Although this higher exposure rate could be linked to for the higher HBV prevalence of among nurses, it was very difficult to give a complete explanation for this exposure difference since significant risk difference was not seen between professional categories in our study. However, it looks from other national (Desalegn and Gebresilase, 2013**;** Gashu**,** 2015**;** Habtemu et al., 2019)and international (Perry et al, 2004; Fisman et al, 2007; Talaat et al, 2003**)** studies that high exposure rate among nurses is a common phenomenon.

Generally, prolonged working time and lack of infection prevention training were found to be significant factors associated with high occupational exposure prevalence rate and poor hepatitis preventive practice among the HCWs (CDC, 2001). In our study, more than 65% of occupational exposures were reported among the HCWs who spent more than 40 working hours per week, and prolonged working hour was found to have an inverse correlation with good hepatitis preventive practice. The stressful effects of prolonged working hours had also been indicated as the potential source of occupational exposure for HCWs by the pooled exposure prevalence studies from Africa (Asa et al, 2017) and America **(**Perry et al, 2004; Fisman et al,2007).Likewise**,** lack of infection prevention training was also found significantly to be associated with occupational exposure rate by univariate analysis. In fact, it was the only determinant factor that remained significant for good hepatitis preventive practice after multivariate logistic regression analysis. This was true also in other Ethiopian studies **(**Desalegn and Gebresilase,2013; Tadesse and Tadesse, 2010**).**

B. KAP study of the Traditional Healers

Our study found different ways of hepatitis knowledge acquisition among the traditional healers the awareness of THs to prevent the risks of occupational infectious blood-borne pathogens. Hence**,** only 41% of the THs were found to have attended modern school. The rest 59% were found to have acquired their knowledge of hepatitis through the traditional way of knowledge transmission form their families and from kuranic school. After all, only 38% of the THs were fund to have good knowledge of hepatitis transmission and preventive measures. Hence, they were found to get the least mean knowledge score **(**6%**)** among different professional categories. Generally, low level of educational background (literacy) and lack of infection prevention trainings were found to be significant determinant factors associated with the lower knowledge score among the THs. Hence, the difference in the knowledge score was significant (P= 0.031) between the healers who were educated from modern school and who were not. This shows how education was fundamental to increase the awareness of the healers towards hepatitis transmission and prevention ways. Similar KAP studies from Burkina Faso (Koura et al, 2016) and Uganda (Bagwana, 2015) also showed how literacy (education) is the influential factor to increase.

Apart from poor level of knowledge about hepatitis transmission and preventive strategies, the healers' hepatitis preventive practice was not found to be good, despite the presence of highest

occupational exposures (50%). In our study, level of mean good hepatitis preventive practice was only 13% (1/8), frequent uses of PPE like gloves was reported by only 3(36%) of the THs; proper disposal of medical wastes was practiced by only 2(25%) of the THs ;and only 1(12.5%) of the THs had a history of anti-HBV vaccination. Our finding on the overall level of hepatitis preventive practice (13%) was much lesser as compared to some similar studies conducted in Africa. For example, the study from Burkina Faso had shown a 38 % prevalence of hepatitis preventive practice among the THs (Koura et al, 2016). Generally, lack of training towards awareness building was found once more to be significant in being associated with poor hepatitis preventive practice of the THs in our study. This shows how infection prevention trainings are fundamental to build up the awareness of the THs to prevent occupational risks of hepatitis and to scale up their preventive practice. Similar KAP studies from Burkina Faso (Koura et al, 2016) and Uganda (Bagwana, 2015) had also shown the influence of infection prevention trainings so as to enhance the preventive practice of the healers from occupational infectious blood-borne pathogens.

In general, lack of concern from government health authorities towards the occupational risks of blood borne pathogens among the THs, lack of initiatives to build up awareness regarding occupational risks of infectious blood borne pathogens and scale up the preventive skills of the healers through infection prevention trainings and lack of inclusive health policy that integrating THs in the national health care system of Ethiopia could be the possible root cause of poor awareness level, high occupational exposures rate and poor hepatitis preventive practice among the THs. Occupational exposure among the THs gets less attention and is the neglected issue in the national health policies of most African countries, particularly in the Saharan Africa (Audet et al, 2014). In the contrary, unlike Ethiopia, some African countries like Burkina Faso (Koura et al, 2016) and Mozambique (Audet et al, 2016) have started integrating traditional healers in their national health policies because THs are an alternative treatment options for most of the people in the countries, and they are the core elements in the infection intervention chain of communicable diseases (Audet et al, 2016; Koura et al, 2016; Stanifer et al, 2015).

5.4 Limitations and strengths of the study

Like any other studies, this study had some limitations. Among them; in our study the need for randomization in sampling was limited since enrollment to participate in the study was only on voluntary basis. As it is known volunteer sampling has higher potential to introducing selection biases because the potential study participants who already knew their status and high-risk groups may refrain from participation. Another limitation was that we used only HBsAg as the sero-marker to screen HBV infection. Relaying on detection of only HBsAg may lead to misdiagnosis of the infection because at the early stages of acute HBV infection, HBsAg may not be in the detectable level, and occult HBV infection could have been missed since HBsAg detection unlikely during the latter infection type. Therefore, detection of antibody to HBcAg would have been helpful to increase the detection rate because anti-HBcAg antibody is the only serological marker detectable at the early stage of acute HBV infection, and even during occult infection.

The other limitation of our study was unable to determine the vaccination status of the study participants based on laboratory screening test for anti-HBsAg antibodies. In our study determination of participants' vaccination was made based on oral responses of the respondents. This may create interpersonal bias and decreases the validity of the data. With regard to the traditional healers; our study was limited to recruited more study participants from the healers because of lack of willingness. In addition, our attempt to gather information on the types of ethno-botanical plant that the THs used to treat hepatitis was hampered due lack of collaboration from the healers.

Regarding the strength of the study, the study is the first baseline data that paid attention to enlighten the potential risk of hepatitis among traditional healers aside from allopathic HCWs in Ethiopia.

5.5 Conclusions

This study has found out an HBV infection prevalence rate that falls within an intermediate range among HCWs in the four study sites. However, HCV detection rate was negligibly very low. Given the high occupational exposures rate among the study participants and the relatively more burden of HCV in the general population, this insignificant level of HCV prevalence may not show the true nature of its' prevalence among the study participants.

With regard to the aliphatic HCWs, despite they were found to have good level of knowledge about hepatitis transmission and preventive ways, their risk perception and practical hepatitis preventive practices were poor. As the result, exposure rates for blood, body fluids, needle stick and sharp injuries were very high among these HCWs. In addition, although most HCWs were found to be at risk for occupational infectious blood-borne pathogens, the infection prevention training coverage was very small. Furthermore**,** the gross anti-HBV vaccination coverage was poor. Concerning the THs, neither the knowledge nor hepatitis preventive practice of the THs was found to be good. Like the allopathic HCWs, the overall prevalence of compliance to USP measures was poor and the frequency of different occupational exposures was very high among them. Another critical finding in our study is that little attention has been given to THs in regards to HBV vaccinating and infection prevention training coverage among THs, indicating the lack of inclusive national health policy that let the healers to be an integral component of the national health care system in Ethiopia.

5.6 Recommendations

Health care workers in developing countries like Ethiopia are very limited human resources in the health care settings. Therefore, the issues of their protection from occupational risk of hepatitis should be the primary strategy to avoid shortages of man power due to adverse consequences and sustain a harmonious community health care service. With this regard, respective government health officials should exert their utmost efforts to ensure infection-free work environment for the HCWs. To this end, taking the following measures would be highly commendable:

- The concerned government health officials should make sure that personal protective equipment (PPE) and materials for safe medical waste disposal system be accessible to all HCWs working on infectious diseases like hepatitis;

- Infection prevention centers should be established at each health care delivering organization to monitor occupational exposures, improve immediate reporting and for post exposure management of hepatitis among the HCWs.
- Regular infection prevention trainings should be given to HCWs so that they acquire and utilize skills for proper handling of infectious specimens, safe injection practice, and proper disposal of medical waste and persistent and correct uses of personal protective equipment.
- A surveillance system has to be established in each health facility for registering, reporting and managing of occupational exposures to hepatitis among HCWs infection.
- Regular access of HBV vaccination to HCWs should be considered as an important duty of the health officials.
- In order to maintain the efficacy of the vaccination health authorities should also exert efforts to teach HCWs about importance of taking a complete HBV vaccination and checking the level of protection acquired through this vaccination.
- All measures to be taken to enhancing the safety of the allopathic HCWs should be also offered to the THs. In fact, health policy directions should be inclusive of THs since they are valuable link between community members and clinical health services.
- Further large scale studies should be conducted to determine the magnitude of HCWs to HBV & HCV exposure and serotypes circulating by including more health care workers from other health organizations and by considering other markers like anti-HBc antibodies and nucleic acid amplification.

Declaration

I the undersigned investigator of this research thesis entitled 'The sero-prevalence of hepatitis B and C: the knowledge, attitude and practices' of the health care-workers and the traditional healers at selected study sites of kolfe-keranyo sub city, Addis Ababa Ethiopia' declare that this thesis was composed, analyzed and interpreted by myself except works explicitly indicated as jointly- study in the text. In addition, I confirm that my original paper work was not been presented previously at any academic institutions for any professional qualifications. I have read the university's current research ethics guidelines and accepted the responsibilities for the conduct of procedures. I have obtained the relevant ethical approval and acknowledged my obligations and the rights of my study participants. As per ethical requirements, all secondary literatures that I had used in the thesis were clearly referenced to show they have been adopted to support my thesis. In addition, the collaborative contributors have clearly indicated and acknowledged in the text.

Principal investigator: - Michael Terefe Negerie

Initial…… dates of Initial……..

In my capacity as supervisor of the candidates' thesis, I certify that the above statements are true to the best of my knowledge.

Principal advisor: - Woldaregay Erku Abegaz (PhD)

Initial……. dates of Initial…….

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Annexes

Annex I.English version of Individuals informed consent form

Addis Ababa University, College of Health Sciences, School of medicine, Department of Microbiology: Immunology and Parasitology.

Section 1: Information sheet

Dear Colleague

My name is Michael Terefe Negerie, a post graduate student of Addis Ababa University, college of health science in the department of microbiology, immunology and parasitology. I am carrying out the study on the sero-prevalence of hepatitis B and C virus infection and assessment of the knowledge, attitude and practice among health care workers and traditional healers for the fulfillments of the requirements in master of degree in microbiology.

This questionnaire and laboratory-based study was designed to collect information on the sero prevalence of HBV and HCV infection among high risk health care workers and traditional healers which required a 3-5 ml of blood from volunteer participants for the laboratory diagnosis of HBV and HCV infection. In addition, the study will used short query questionnaire to be answered by the study participants that is very important to trace the risk factors that may expose health care workers and traditional healers for HBV and HCV infection, and to analyze how far is the knowledge of health care workers and traditional healers about the transmission and the prevention of the disease, how far they are safe against the infection through vaccination and what advocacy policies are available for the protection of them by government officials.

Dear colleague, beyond a good opportunity created by this study for study participants to evaluate their serological status for HBV and HCV infection, its result will have a great importance to identify root cause problems and highlight the gaps for the government public health stockholders so as to deal with the problem and take necessary actions for the protection of health workers from occupational hazards of HBV and HCV infection.

Thank, you

Section 2: consent form

Dear colleague

I think you have clearly understood the purpose of this study. If so, your genuine participation in the study and filling the questionnaire with honest information is very important and highly appreciated for the fruitful outcomes of the study.

Dear colleague, I would like to assure you that you will no need to display your personal information and all your information will be masked through identification code numbers. Furthermore, I would like to assure you any information gathered in the study will be kept strictly confidential and will not be used for any other purpose apart from the intentions of this study. Finally, since it is very important to confirm your consent to take part or not in the study, you would be requested with a great honor to confirm your decision by answering the question below.

Are you willing to participate in the study? If you are willing to take part in the study, you are kindly asked to check the "yes" box below, and put your signature in the appropriate space provided.

☐Yes ☐No

ID code of the study participant: _____

Signature:_____

Date: _____

Name of witness: _____

Signature: _____

Date: _____

Name of a person who got this consent signed: _____

Signature: _____

Date: _____

Thank you

Questionnaire Number---------- Date of Interview----------

Name of health facility----------

Annex II. Amharic version of Individuals informed consent form

ቅፅ 1: ስለጥናቱ አላማና አስፈላጊነት የሚገልፅ መረጃ

የተከበሩ የጤና ባለሙያ እኔ ሚካኤል ተረፈ በአዲስ አበባ ዩንቨርሲቲ የማይክሮባዮሎጂ ትምህርት ክፍል በሁለተኛ ዲግሪ ተመራቂ ተማሪ ስሆን የጤና ባለሙያዎች ለተለያዩ በሽታዎች ተጋላጪ እንደመሆናቸው መጠን የመመረቂያ የጥናት ፅሁፍን የሄፒታይተስቢ እና ሲቨይረስ ለጤና ባለሙያው ላይ ያለውን ስርጭትና ባለሙያውን ለበሽታው የሚያጋልጡ ምክንያቶችን በማጥናት ላየ እገኛለሁ፡፡

ለዚህ ምጥናቱ የበሽታውን ስርጭት ለመገምገም ፍቃደኛ ከሆኑ የጤና ባለሙያዎች የደም ናሙና ባመውሰድ የሄፖ`ታናተስ ቢ እና ሲ ባይረስ ስርጭትን ለላባራቶሪ ምርመራ ከግል ጥናት ባሻገር ለበሽታው ስርጭት መንስኤ ሊሆን የሚችሉትን ምክንያቶች ማለትም ባለሙያው ስለበሽታው ስርጭትና መከላከያ ዘዴዎች ያለውን ግንዛቤ፣ ስለበሽታው ያለውን ዝንባሌ በሽታውን ለመከላከል የሚያደርገውን ተግባራት አጭር ቃለ መጠየቅ በማድረግ ይመዘናል፡፡

የተከበሩ የጤና ባለሙያ ይህ ጥናት የጤና ባለሙያዎች በበሽታው ዙሪያ ያላቸውን የጤና አቋም እንዲገመግሙ መልካም አጋጣሚ ከመፍጠሩ ምባሻገር የችግሩን መጠንና ምክንያቶች ለሚመለከታቸዉ ባለድርሻ አካላት በማሳየት ለጉዳዩ ትኩት ሰጠው እንዲሰሩ ማለትም ባለሙያውን ከበሽታው ለመታደግ በቂ የመከላከያ ክትባት ከማቅረብ ባለፈ በባለሙያ ውላይ የተስተዋ ሊየክህሎት ክፍተቶችን በተለያዩ ስልጠናዎች እንዲገነባ ያግዛል፡፡

ኣመሰግናለው፡፡

ቅፅ 2: የጥናቱ የውል ስምምነት

ውድ የጤና ባለሙያ ይህ የጥናት አላማ ከግብይ ደርስ ዘንድ የእርሶ በጥናቱ ላይ ቀጥተኛ ተሳታፊና ጥናቱ የሚጠይቀውን መጠይቆች በጥንቃቄ መመላት በጣም ጉልህ ድርሻ አለው። ይህ ጥናት ከተጠቀሰው አላማ ውጪ ለምንም አላማ የማይውልና በጥናቱ ላይ የሚሳተፉ ባለሙያወች ሚስጥራቸዉ ይጠበቅ ዘንድ ሚስጥራዊ ኮድ ከመጠቀም ውጪ ማንነታቸዉን የሚጠይቅ መጠይቅ አለመጠቀሙን ላረጋግጥሎ እወዳለሁ።

በመጨረሻ በጥናቱ ላይ ለመሳተፍ ወይም አለመሳተፍ በእርሶ መብት ላይ የተመሠረት ለመሆኑ ስለውሳኔዎ ከታች የተመለቀተውን ጥያቄ ለመመለስ እንዲያረጋግጡልኝ በታላቅ አክብሮት እጠይቃለሁ።

በጥናቱ ላይ ለመሳተፍ ይፈልጋሉ?

□አዎን እፈልጋለሁለ□አልፈልግም

የጥናቱ ተሳታፊ መለያ ኮድ---------- የእማኝ ስም----------

ፊርማ---------- ፊርማ----------

ቀን---------- ቀን----------

ውሉን ያረጋገጠው ሰው ስም---------- የመጠይቅ ቁጥር----------

ፊርማ---------- የህክምና ተቋም ስም----------

ቀን---------- ቃለመጠየቅ የተደረገበት ቀን----------

Annex III. English version of the Questionnaire

Instruction: Choose and check (√) in the box the one that seems best for you from the alternatives that are beneath each question and for those that you give direct answer, write the answer in the space provided.

PART 1 participant's demography

1. Professional category

□ Physician□ health officer □ midwifery □ Nurse

□ Laboratory technician □ anesthetist □ others specify_____

2. Age

□ 29 years or below□ 30 - 39 years□ 40 - 49 years□50 years and above

3. Gender □Male □Female

4. Marital status

□ Single□ Married□ Widowed/Widower□ Divorced

5. Place of work

Governmental:

□Hospital □health center □clinic □health post □others specify_____

Private sector as a part-time worker:

□Hospital □health center □clinic □health post □others specify_____

6. Section/department of operation? (you can choose multiple)

□Outpatient □In patient □Operating theatres □Laboratory

□emergency room □ delivery ward

7. Average number of hours on work per week**?**

□less than 40hrs □ 40-60hrs □ greater than 60hrs

8. Work experience?

□ Less than one year□ 1 - 5 years□ 6 - 10 years □More than 10 years

PART 2.Questions to evaluate the level of knowledge of the study participants

What causes hepatitis B and C infection?

causes	yes	no
fungi		
parasite		
virus		
bacteria		

1. Are hepatitis B and C curable disease? □yes □no □not sure
2. Are Hepatitis B and C infections cause liver cancer? □yes □no □not sure
3. Can vaccine prevent hepatitis B infection? □yes □no □not sure
4. There is a vaccine to prevent hepatitis C infection □I agree □disagree □no opinion
5. Do you know that there is post exposure prophylaxis for hepatitis B infection?
   □yes I know □I don't know □not sure
6. What are the possible roots of hepatitis B and C transmission? (you can select multiple options)

roots	yes	no	Not sure
By contaminated food and water			
From an infected person by breezing			
By unsafe sex			
By contaminated blood and body fluids			
by contaminated needles and surgical instruments			
By traditional tattoo practice			
Transmitted mother to child			
Transmitted by mosquito bits			
Contact with pets (dogs and cats)			

Part 3 ATTITUDE QUETIONS

1. I feel comfortable during taking care of people with hepatitis B and C infection
   □ I agree □disagree □ not sure
2. you can get hepatitis as occupational exposure□ I agree □disagree □ not sure
3. your job puts you at high risk of hepatitis infection□ I agree □disagree □ not sure
4. Sero positive health care workers could not be a potential source of the infection to patients.□ I agree □disagree □ not sure
5. HBV vaccines are effective and safe to prevent the infection□ I agree □disagree □ not sure
6. After vaccination, regular blood test for hepatitis infection is not important
   □ I agree □disagree □ not sure
7. After exposure to contagious material, vaccines can reduce the likelihood of being positive.□ I agree □disagree □ not sure
8. Changing of gloves during blood collection and tests is waste of time
   □ I agree □disagree □ not sure

PART 4 PRACTICES QUETIONS

1. Do you use personal protective equipment like gloves, gowns and masks, when operating?□Always □Occasionally □Never
2. Doyou discard medical wastes like needles, syringe and sharps properly after use?

□Yes □No

3. Have you ever been exposed to biological infectious materials like blood and body fluid at your work place?□Yes □No□ I don't remember
4. If yeas for Q- no 3, what was the potential source of exposure?
   □ percutaneous needle and sharp injury
   □ Cutaneous splash of blood and amniotic fluid
   □ Splash of test serum on un intact skin
   □ others_____

5. If yeas for Q- no 3, what was the factor you think responsible for that exposure?
   □ Work load due to shortage of man power □working for long period of time
   □careless handling of the patient or infectious material □lack of infection prevention material□ others specify_____
6. If you yes for Q- no 3, what was your immediate measure? (multiple answers are possible)
   □ Bleed injured body part □washing and clean with anti septic
   □ checking the status of source sample □ others_____
7. If yeas for Q- no 3, have you reported to concerned body?

□Yes, I have reported□ have not reported □ I don't remember

8. If not reported, what was the reason for not reporting?

□Fear of getting into Trouble □ time inconvenience due to work load

□un availability of a system □ others_____

9. If you reported, have you taken any post exposure prophylaxis within 72hrs of exposure?

□Yes, I have □No, I haven't

10. If you have not taken post exposure prophylaxis, what was the reason?
    □ not knowing its availability □ being negligence □ time inconvenience
    □ lack of a service in your facility □others_____
11. Have you ever done a blood screening test for hepatitis B and C infection?□yes □ no
12. If no, what was the reason?
    □ Unaware of its availability in the facility □fear of being positive
    □do to time inconvenience □others_____
13. Have you received Hepatitis B vaccination?□yes □ no
14. If yes for Q no 13, how many doses of vaccine did you take?
    □ I have taken all the three doses of vaccines.□ I have received two doses of vaccine
    □ I have received only one dose of vaccine
15. If you have got vaccinated at list for the first dose of a vaccine, have you ever check your immunity of serum antibody level after vaccination? □ yes □ no
16. If your answer is no for the above question, what was your reason for not check up your serum antibody level after vaccination?
    □ Lack of awareness about its necessity and importance

□Lack of screening device to measure the antibody level

□ Due to time inconvenience

□others_____

17. If you have not been get vaccinated or not completed the full doses of the vaccine, what was the reason?□ Costs of the vaccine □ Less accessibility of the vaccine

□ Fear of its complication □ Lack of information on its access □others_____

18. Have you ever attained any training program related to infection prevention?□ yes □ no

19. What will you do if you think that you have symptom of hepatitis?

□ I will do a blood check up in health facilities

□ go to traditional healers

□ go to religious institutions

□ Others specify_____

Annex IV. **Amharic translated questioner**

ክፍል 1 ስለተሳታፊውየግልመረጃ

1. **የሙያ ዘርፍ**□አጠቃላይ ሃኪም □ጤና መኮንን □አዋላጅ ነርስ □ክሊኒካ ልነርስ □የላብራቶሪ ባለሙያ □ ሌላ----------
2. **ዕድሜ** □29 እና ከ20 በታች □ ከ30- 39 □ከ40-49 □ከ50 እና ከዚያ በላይ
3. **ፆታ**□ ወንድ □ሴት
4. **የጋብቻ ሁኔታ**□ ያላ ገባ □ ያገባ □አግብቶ የፈታ □ሌላ----------
5. **የስራ ቦታ** የመንግስት መስሪያ ቤት □ሆስፒታል □ጤና ጣቢያ □ክሊኒክ □ሌላ----------
6. **በተቋሙ ውስጥ የሚመሩ በት የሥራ ክፍል**□ በተመላላሽ ህክምና ክፍል □ በአስተኝቶ ህክምና ክፍል □ በድንገተኛ ክፍል □ማዋለጃ □ ለባራቶሪ ክፍል □ ሌላ----------
7. **በሳምንት ውስጥ በአማካኝ በስራ ላይ የሚያሳልፉት ሰዓት**□ ከ40 ሰዓት ያነሰ □ ከ40-60 ሰዓት □ ከ60 ሰዓት የበለጠ □ ሌላ----------
8. **የስራ ልምድ**□ከ1አመት ያነሰ □ከ1-5 ዓመት □ከ6-10 ዓመት □ከ10 አመት በላይ

ክፍል 2ተሳታፊሄፒታይተስቢእናሲቫይረስያለውዕውቀት

1. የሄፒታይተስ ቢ እና ሲ በሽታን የሚያመጥው ጀርም ምንድ ነው?
   □ ባክቴርያ □ ፈንገስ □ ቫይረስ □ ፓራሳይት
2. የሄፒታይተስ ቢ እና ሲ በሽታ መተላለፊያ መንገዶች የትኞቹ ናቸው ?/ ከአንድ በላይ መልስ መስጠት ይቻላል/

ተ.ቁ	የበሽታው መተላለፊያ መንገዶች	ይተላለፋል	አይተላለፍም
	በተበከለ ምግብና መጠጥ		
	በበሽታው ከተያዘ ሰው በትንፋሽ		
	ጥንቃቄ በጎደለው የግብረ ስጋ ግንኙነት		
	በደም በተበከሉ ስለታም ነገሮች		
	በበሽታው ያለበትን ደም መነካካት		
	በባህላዊ ንቅሳት		
	ከእናት ወደ ልጅ		

	በወባ ትንኝ ንክሻ		
	ከቤት እንስሳት ጋር በመጫወት		

3. የሄፒታተስ ቢ እና ሲ ህክምና አላቸው? አዎአላቸው የላቸውም
4. የሄፒታተስ ቢ እና ሲ በሽታ የጉበት ካንሰር ያስከትላሉ? አዎ አያስከትሉም
5. የሄፒታተስ ቢ በክትባት መከላከል እንደሚቻል ያውቃሉ? ይቻላል አይቻልም
6. የሄፒታተስ ሲ በሽታን ለመከላከል የሚያስችል ክትባት እንዳለ ያውቃሉ? አዎ የለም
7. ለሄፒታተስ ቢ ሊያጋልጡ በሚችሉት ነገሮች ከተጋለጠ በኃላ በሽታው በደሙ እንዳይሠራ ምየሚረዳ መድሃኒት መኖ\ን ያውቃሉ? አውቃለው አላውቅም

ክፍል3 የጥናቱ ተሳታፊ ስለሄፒታተስ ቢ እና ሲ በሽታ ያለውት አመለካከት

1. የሄፒታተስ ቢ ወይንም ሲ በሽታ ያለበትን ሰው መንስኤ ለበሽታው ተጋላጭ ያደርጋል
   እስማማለሁ አልስማማም
2. የለዎት የህክመና ሙያ ዘርፍ ሄፒታተስ ቢ ወይንም ሲ በሽታ ሊያጋልጥ እንደሚችል አስበው ያውቃሉ፡፡አዎእንደሚያጋልጥአስቢአለው አይአለስብም
3. የሄፒታተስ ቢ ወይም ሲ በሽታ ያለባቸዉ የሙያ አጋር የበሽታው ምንጭ ሊሆኑ እንደሚችሉ ያስባሉ?
   አዎ አስባለው አይ አላስብም
4. የሄፒታተስ ቢ በሽታ መከላከያ ክትባቶች በሽታው እንዳይተላልፍ ከማድረግ አንፃር ውጤታማ ናቸው?
   እስማማለው አልስማማም
5. አንድ ሰው የሄፒታተስ ቢ መከላያ ክትባት ከወሰደ በኃላ የላብራቶሪ ምርመራ ማድረግ አስፈላጊ አይደለም እስማማለው አልስማማም
6. አንድ ሰው ለሄፒታተስ ቢ ተጋላጭ ከሆነ በኃላ በሽታው እንዲሰራጭ የሚወሰደው መድሃኒት / ስስት ኤክስፐርት ኘሮፊሽሲስ/ ውጤታማ አይደለም እስማማለው አልስማማም
7. የህክምና እርዳታ ለምታደግብት ወቅት የጎንት መጠቀምና ላንችን ቶሎ ቶሎ መቀያየር አስፈላጊ አይደለም ? እስማማለው አልስማማም

ክፍል4የጥናቱተሳታፊየሄፒታይተስቢእናሲበሽታንለመከላከልስለሚወሰዳቸውተግባራትመጠየቅ

1. በስራህ በተለየ የይፒታተስ ቢ እና ሲ በሽታን ለመከላል የሚረዳህን ማለትም እንደጓንት ፣ ጋወን፣ የአይን መከላከያ መነፅር ወዘተ.. ትጠቀማለህ?

▯ እጠቀማለው ▯ ኣልጠቀምም

2. በህክምና አገልግሎት ወቅት የተጠቀምክባቸውን መሳሪያዎችና የህክምና ዉጋጆች በአግባቡ ታስወግዳለህ ?

   ▯ አዎ አስወግዳለው ▯ አይ አላስወግድም

3. በስራዎ ላይ ለተበከሉ ደምና የሰውነት ፈሳሾች የመጋለጥ አጋጣሚ አጋጥሞት ያውቃሉ?

   ▯ ኣዎ ያውቃል ▯ አያውቅም ▯ አላስታውስም

4. አጋጥሞት ካወቀ አጋጣሚው የተፈጠረበት መንገድ ምንድን ነበሪ?

   ▯ በህክምና እርዳታ ወቅት በመርፌና በሌላ ስለታም ነገር መወጋት

   ▯ የደምና የሰውነት ፈሳሽ በአይንና በአፊ መረጨት

   ▯ የደምና የሰውት ፈሳሽ እጅዎ ላይ መረጨት

   ▯ ሌላ----------

5. ለደምና ለሰውት ፈሳሾች ተጋልጠከ ከነበረ ለኣጋጣሚው መፈጠር ምክንያት ምንድን ነበር?

   ▯ የሥራ ጫና ▯ ያለ እርፍት ለረጅም ሰዓት በስራ ላይ ማሳለፍ ▯ ችልተኝነት

   ▯ ለመከላከያ የሚረዱ ግብአቶች እጥረት ▯ ሌላ----------

6. በተለያዩ መንገዶች ለደምና ለሰውነት ፈሳሾች በተጋላጭ ወቅት የወሰድከው አፋጣኝ እርምጃ ምንድን ነበር?

   ▯ በመርፌና በስለታም ነገር የተወጋውን አካል በመጨን ደም ወደ ውጭ እንዲወጣ ማድረግ

   ▯ ደም ወይም የሰውነት ፈሳሽ ያረፈበትን ቦታ ማጠብና በኬሚካል ማፅዳት

   ▯ የደም ወይም የሰውት ፈሳሹን ጤንነት ሁኔታ በላቦራቶሪ መመርመር

   ▯ ሌላ----------

7. ለደምና ለሰውነት ፈሳሾች በተጋለጥክበት ወቅት ለሚመለከተው አካል በአፋጣኝ አመልክተሀል?

   ▯ አዎ ኣመልክችለው ▯ አይ አላመለከትኩም

8. አመልክተህ ካልነበረ ምክንያትህ ምንድን ነበር?

   ▯ ፋራቻ ▯ በስራ ጫና ምክንያት በቂ ጊዜ ስላልነበረ

   ▯ የሚመለከተው አካልና መዋቅ ስለሌለ ▯ ሌላ----------

9. ተጋልጠህ በነበረበት ወቅት በአፋጣኝ ለሚመለከተው አካል አመልክተ ከነበረ አንድ ሰው ለሄፒታተስ ከተጋለጠበ ኃላ በሽታው በደም ውስጥ አንዳይሰራጭ የሚሰጠውን መድሃኔት / ፖስት ኤክስፖሻር ፕሮፕራክላክሲስ/ ከ72 ሰዓታ ባላነሰ ጊዜ ውስጥ ወስደዋል?

☐ አዎ ወስጃለው ☐አይ አልወሰድኩም

10.ካልወሰዱ ምክንያቱ ምንድ ነበረ?

☐ መድሃኒቱ መኖሩን ካለማወቅ ☐ ቸልተኝነት ☐ የጊዜ እጥረት ☐ሌላ---------

11.የሄፒታተስ ቢ ወይም ሲ ቫይረስ በደሞዎ ውስጥ እንዳለና እንደሌለ ለማረጋገጥ የላብራቶሪ ምርመራ አድርገው ያውቃሉ? ☐ አዎአውቃለሁ ☐አይአለውቅም

12.የደሞ ምርመራ አድርገው ካላወቁ ምክንያቱ ምንድን ነበር?

☐ምርመራው መኖሩን ካለማወቅ ☐በሽታው ቢገኝብኝስ ብሎ በመስጋት

☐ በቂ ጊዜ ያለመኖር ☐ሌላ----------

13.የሄፒታተስ ቢ መከላከያ ክትባት ወስደው ያውቃሉ? ☐አዎ ☐አይ

14.መልስዎ አዎ ከሆነ ለምን ያህል ጊዜ ወስደዋል?

☐ ሶስት ጊዜ በተገቢው ሰዓት ☐ሁለት ጊዜ ☐አንድ ጊዜ

15.የሄፒታተስ ቢክትባት ከወሰዱ በኃላ በሰውነትዎ ውስጥ የተፈጠረውን የመከላከል ብቃት ለመገምገም የላብራቶሪ ምርመራ አድርገዋል? ☐ አዎኣድርጊለው ☐ አይኣላደረኩም

16.ከላይ ለቀረበው ጥያቄ መልስዎ የላብራቶሪ ምርመራ አላደረኩም ከሆነ ምክንያቱ ምንድን ነበር?

☐ ክትባቱ ከተወሰደ በኃላ የላብራቶሪ ምርመራ እንደሚያስፈልግ ወረጃ ስላልነበረኝ

☐ የላብራቶሪ ምርመራው በተቋሙ ውስጥ ባለመኖሩ

☐ በቂ ጊዜ ስላልነበረ

☐ ሌላ----------

17.የሄፒታተስ ቢ መከላከያ ክትባት ፈፅሞ ወስደው ካላወቁ ወይም ካላጠናቀቁ ምክንያትዎ ምንድን ነበር?

☐ የክትባት ዋጋት ልቅነት ☐ ክትባቱ ሊያመጣ የሚችለውን የጎንዩ ሽችግር በመፍራት

☐ ክትባቱ ሊገኝ ባለመቻሉ ☐ ስለክትባቱ መኖር መረጃ ስለሌለኝ ☐ ሌላ----------

18.በስራ ቦትው የሄፒታተስ ቢ እና ሲ በሽታ ለመከላል የሚያስችሉ የአቅም ግምባታ ስልጠናዎችን ያገኛሉ?

□አዎ□አይ

Annex V. **Subjects laboratory serological test result tracking sheet**

Name of facility	Subject code	Rapid anti-body test				Confirmatory antigen test					
		HBsAg (Ag) test		Anti-HCV (Ab) test		HBcAg (Ag) test		HBeAg (Ag) test		HCV-RNA (Ag) test	
		neg	pos	neg	pos	neg	pos	neg	pos	neg	pos